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IMPROVED BOILER AND FEED WATER HEATER.

We publish herewith illustrations of a boiler designed expressly to economize fuel. We select them from the pages of *Iron*, which journal accompanies them with some sensible remarks, the gist of which is as follows:

If there is one department of engineering receiving more attention than any other at present, it is that of economy of fuel. And this is very justly so, since, like a horse, the expense of boiler or engine power does not lie in its first cost, but in what it afterwards consumes. We take it, as a rough calculation, that an ordinary land boiler will burn its own value in coals about every six or nine months, according to its efficiency and economy.

There is, undoubtedly, very wide margin for improvement in our present construction of boilers and engines. It is well known that only about one tenth of the theoretical value of the motive power of fuel is utilized in ordinary boilers and engines. What a fearful waste this nine tenths of the whole fuel used represents! Money thrown away; our natural resources more rapidly impoverished; the atmosphere laden with carbonic acid and other impurities; and our buildings and edifices disfigured with our wasted coal, or soot.

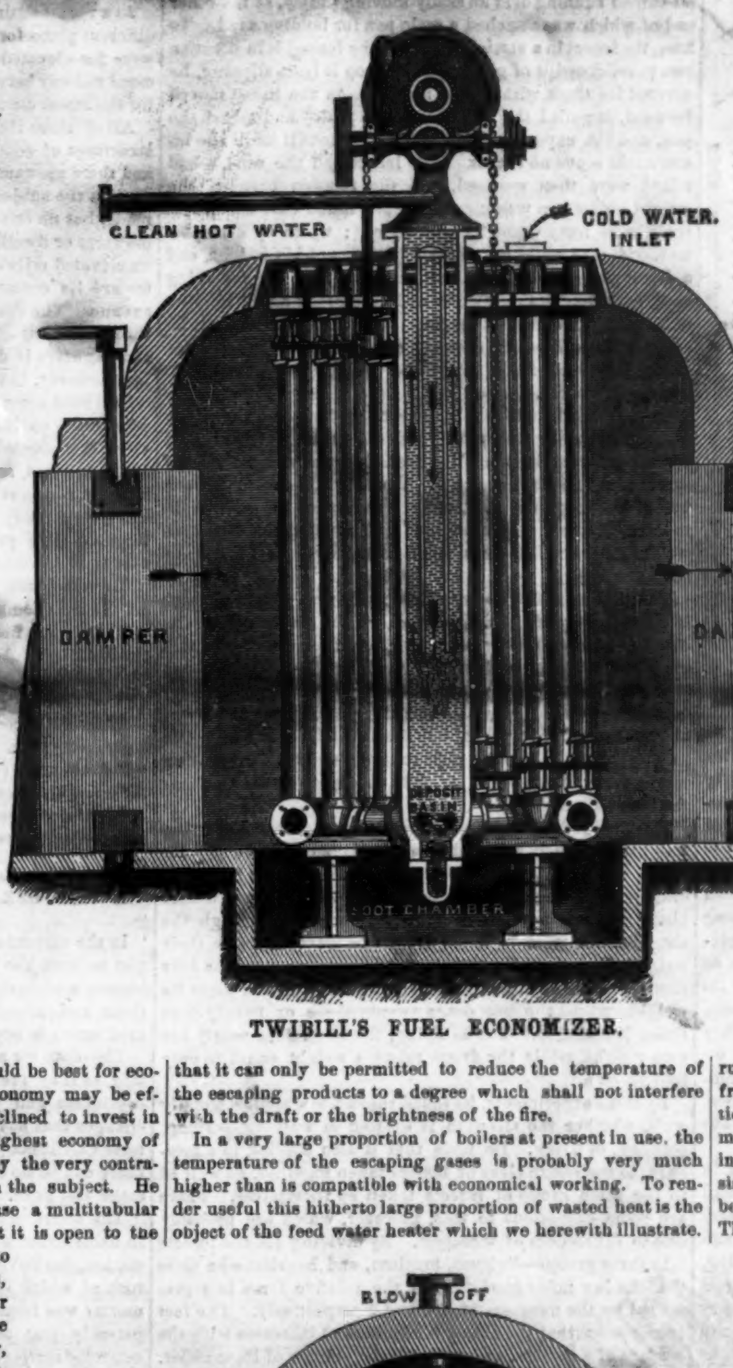
A considerable portion of this waste of power lies with the mechanical arrangements of the engine. It is comparatively lately that the true principles of obtaining the full work from the steam used has been fully and generally understood. Unrestricted radiation from cylinders, boilers, and pipes, poor expansion, and throttling in the steam pipes are to be thanked for much of this waste. Probably, however, much more is to be attributed to the wasteful use of fuel in boilers. This may be occasioned in many ways, but the sum total of the matter will always amount to the fact that so much of the whole fuel and heat goes out of the chimney unutilized. It is thus that such a very striking saving in fuel may, with the best arrangements, be effected.

It is a difficult matter to decide immediately what description of boiler should be best for economy, or in what direction the most economy may be effected. If a user of steam power be inclined to invest in the best boiler he can obtain for the highest economy of fuel, he would very soon be bewildered by the very contradictory statements that he might hear on the subject. He will hear, in one direction, that he must use a multitubular boiler for economy, although he sees that it is open to the grave defects of complexity, difficult to clean, liability to wear out in the tubes, and so on. On the other hand, he will hear it stoutly maintained, and very fairly borne out by facts, that the old Cornish boiler, properly used, cannot be beaten for economy of fuel, and gives at the same time the utmost solidity, facility for cleaning, and the greatest durability.

Some engineers will be found to rely most for economy on special grate arrangements—patent fire doors, automatic stokers, fire bars, etc. Others will laugh these to scorn, and say that they are useless newfangled notions, and simply are a further expense and trouble. It is probable that there is some truth in all the various opinions, and the varying practical results are achieved according to the special circumstances of each case.

We only propose to consider the action and waste of the hot gases of combustion in being allowed to pass freely into the open air. It is at once seen that the comparison between the temperature in the fire box and in the chimney will give us one of the best tests as to the economy with which the boiler is working, and that for perfect economy the escaping heat should not be greater than that of the steam. The question is, how is this effect to be obtained? And, if obtained, will it answer, practically?

To reply to the last query first: It would not answer, practically, to reduce the temperature of the escaping hot gases to that of steam, for, in that case, the draft would be too materially checked, and the fire would only smolder, and might even be put out. For whatever causes would tend to reduce the temperature of the escaping gases so low must be a constant cause always in operation. We therefore see that it can only be permitted to reduce the temperature of the escaping products to a degree which shall not interfere with the draft or the brightness of the fire.



TWIBILL'S FUEL ECONOMIZER.

In a very large proportion of boilers at present in use, the temperature of the escaping gases is probably very much higher than is compatible with economical working. To render useful this hitherto large proportion of wasted heat is the object of the feed water heater which we herewith illustrate.

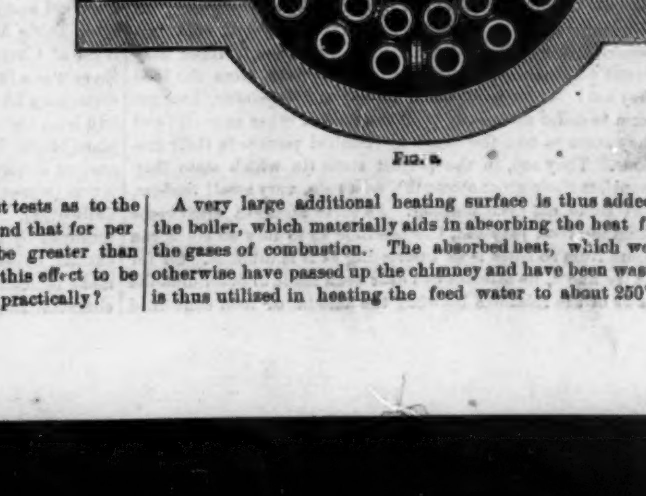


Fig. 2.

A very large additional heating surface is thus added to the boiler, which materially aids in absorbing the heat from the gases of combustion. The absorbed heat, which would otherwise have passed up the chimney and have been wasted, is thus utilized in heating the feed water to about 250° or 300° Fah. This is sufficient to effect a gain of from 15 per cent to 30 per cent on the former consumption of fuel, depending upon the amount of heat formerly going to waste in the different instances. The broad principle on which such considerable economy may be effected is easily seen when we consider that, if the whole of the water evaporated is raised from 60° to 300° before going into the boiler, this represents some 20 or 25 per cent of the whole heat required to vaporize the water into steam.

Referring to our illustration, we see a circular arrangement of the pipes of the economiser, which admits of a very convenient attachment in the center of his latest patented improvement, namely, the feed water filter. The sectional view, Fig. 1, shows this useful addition to the feed water heater. The hot water, after having ascended to the top of the outside set of pipes, and having been thus raised to its highest temperature, is then ready to precipitate and part with its suspended matter. This is effected by diverting the stream downwards through a central pipe in the filter into the deposit basin below, the clean feed water ascending again around the descending tube, and being thence taken to the boiler. The suspended sediment becomes separated from the water by the abrupt reversal of the current, and thus collects in the basin provided for that purpose at the bottom of the filter. This deposit basin is fitted with a door or cover, from which the sediment can be removed as it collects.

The importance that should be always attached to the prevention of incrustation upon the heating surfaces of boilers is now becoming more thoroughly appreciated. The advantages derived from keeping boilers clean are threefold; first, greater safety against explosion, since the failing of plates is frequently due to their overheating or burning from deposit; second, much greater economy in the evaporation of water, as calcareous sediment is a very bad conductor of heat; third, considerable economy in the cost of boiler repairs, as the plates, being always exposed to the water, are less likely to become leaky. The inventor uses quadruple scrapers, which insure perfect cleanness of his tubes from soot. The raising and lowering action in our illustration is very simple and compact, and a considerable improvement over former arrangements. An advantage in the way in which the tubes are connected at the top and bottom consists in their connections being separate circular pipes—the best form to resist pressure—rather than a flat-sided box. The arrangement also admits of very easy withdrawal and replacing of any one of the tubes when required, the bottom joint being made on a slightly tapered face. The joints are all made metal to metal, and will, therefore, stand any amount of heat. This boiler and heater is the invention of Mr. Joseph Twibill, of Hulme, near Manchester, England.

New Electro-Magnetic Clock.

Messrs. T. Cooke and Sons, of York, England, have completed the erection of an electric motor and clock dial in the telegraph gallery of the new buildings of the General Post Office, London, which, in some points, is novel and interesting. The hands of the large dial, which are driven by the motor, are at a distance of about forty-five feet from it, and are connected to it by means of iron rods and several pair of bevel wheels for turning the hands. The dial itself is six feet in diameter, and such is the sensitiveness and power of the motor that the connecting rods, bevel wheel work, and hands, are driven by a single Lelanché cell of small size, the current from which is transmitted by the standard clock in the gallery. The motor consists simply of a polarized pendulum vibrating between two pairs of electro magnets, carrying a double ratchet at the upper end, the pointer of which is worked by a vane at the top of the buildings.

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Contents.

(Illustrated articles are marked with an asterisk.)

THE STRENGTH OF INSECTS.

It is said that he is a philosopher who can accept the inevitable without repining. There are times in our lives when the most unpleasant things are forced upon our attention, and we fail with our best efforts to rid ourselves of them. As warm weather advances, we need no argument to convince us that the insects which destroy our vegetation, offend us with their presence, and even without permission cause our own blood to course through their veins, are among the inevitables. To accept these without complaint or repining would surely give us undisputed title to the name of philosophers; and if we could find anything of pleasure instead of annoyance in our involuntary contemplation of them, we would be doubly worthy of the appellation. That they all serve some useful purpose, cannot be denied; and if we knew their whole history we should doubtless be fully convinced of this. Some of our greatest pests, as flies and mosquitoes, have already been shown quite clearly to be our friends rather than our enemies.

Besides their practical benefit, there is no little interest in noticing the great physical force which they exert. We call a man, a horse, a lion, or an elephant strong; but it is very easy to see that, proportionally, insects are the strongest animals that live. They manifest their strength in running, leaping, flying, and sometimes in other ways. Some insects have been known to run so rapidly that, if a man of ordinary size should make as good time, proportionally, he would run more than twenty miles per minute, or sixty times the ordinary rate of a railroad train. A locust with the aid of its wings will leap 200 times its own length; to equal which, a man would need to leap nearly a quarter of a mile. A flea, without wings, will leap the same relative distance; and it has been estimated that, if a horse should jump as far in proportion to its weight, it would scale the Rocky Mountains in a single leap. Most insects jump by means of their hind legs and the latter part of the hind body; but one family of beetles—the *elateridæ* or spring beetles—leap vertically when on their backs, by use of a spine on the hinder part of the thorax which fits into a cavity behind it, and which, when forcibly closed and acting like a spring, throws the beetle several inches into the air. While in the very act of writing this, one of this family pays me a visit, and shows its power by making several springs at least six inches in hight, which is about twelve times its own length. Some dragon flies are among the strongest on the wing. They can be seen flying about pools of water after smaller insects for hours at a time, turning, wheeling, going sideways, and in nearly every conceivable direction, and never seem to think of being tired. And, what is very remarkable, they have the power of changing at right angles the direction of their flight, and so suddenly that one can hardly ever be quick enough to hit or capture them. The *Entomological Magazine* speaks of one of these that flew on a vessel at sea when the nearest land was the coast of Africa, 500 miles away. A humble bee has been seen to follow a rail car going twenty miles per hour, against a strong wind, for a considerable distance; and it even went faster than the car, as it flew to and fro and in various zigzags around the vehicle. Some beetles have a flight swifter, considering their size, than any bird; and Linnæus mentions a butterfly that sometimes travels more than a hundred miles on the wing at one flight; he also says that an elephant having the force of a horn beetle would be able to move a mountain. All have doubtless seen a beetle move a candlestick or lamp in his efforts to escape from underneath it; and he has been compared to a prisoner in Newgate shaking the building with his back. Pliny said, long ago, that, if we compare the loads of ants with the size of their bodies, "it must be allowed that no other animal is endowed with such strength in proportion."

Some interesting and ingenious experiments for measuring the strength of insects have lately been made by a Belgian naturalist named Plateau. He first tested their power of raising weights while walking on a level surface. His novel method of doing this was to harness the insect by a horizontal thread running over an easily-moving pulley, at the other end of which was attached a scale pan for holding sand. To keep the insect in a straight direction, he fenced it in between two parallel strips of glass; and to keep it from slipping, he covered its track with coarse muslin. As the insect moved forward, it pulled the thread over the pulley and raised the pan, and the experimenter poured sand into it until the insect could move no longer. The insect and the sand it had raised were then weighed, and the relation between the weight of the two was obtained. He found that the insect could raise forty times its own weight; while by a similar method a man could raise only five sixths of his weight, and a horse only one half or two thirds of his. By repeating each experiment three times and employing a vast number of insects of various sizes, and comparing his results, he came to the conclusion that the smaller insects in the same group invariably raise the greater weight in proportion to their own weight.

He then tried their leaping power, by fastening the wings and elytra, and by suspending under the thorax (by a thread) bits of lead set in wax. He increased the weight till the insect could no longer raise it. Then, by his determinations as before, he found that, while the largest crickets could raise in this way only about one and a half times their own weight, the smaller ones could raise three or four times theirs.

To test the pushing power of insects, he placed some of them in a long cardboard tube blackened on the inside and admitting light only by a transparent glass at one end. To this glass was attached a lever which drew the scale pan over the pulley, as in the first experiment. The insect, in its endeavors to escape, pushed against the glass, moved the lever, and thus raised the weight. As results of these experiments, he found that, in inverse ratio to their weight, the pushing power varied from three or four to eighty or ninety times the insect's weight.

The power of flight possessed by insects was tested by fixing weights to the body in the same way as in leaping. He found that they employ much less force in flying than in other efforts of strength; perhaps this is because, unlike birds, they are not intended to carry weights through the air. Beetles raise in flight from one sixth to twice their weight; flies, three times their weight. A drone weighs four times as much as a bee, and drags less than fifteen times its weight, while the bee drags twenty-three or twenty-four times her weight. But in flying, the bee raises nearly her own weight, while the drone raises a weight equal to only half its own.

By these experiments, he found that his law applies equally well, whether the strength is exerted in walking, leaping, pushing, or flying. He finds that it also applies, in a measure, to the entire class of insects taken together, as well as to the same group of insects taken by themselves. There are some exceptions to this, however, which are probably due to differences of structure. By dividing all the insects into three groups—lightest, medium, and heaviest—he finds that the law holds good. Then the relative force is represented by the numbers 26, 19, and 9 respectively. The fact seems to be that the strength of an insect increases with the surface of a section, and not with the volume of its muscles. This would make the weight increase faster than the motive power, and be consistent with the law that the smallest are strongest. It takes but a moment's reflection to see the wisdom of this arrangement. Of course the hardness of the soil, the weight of the grains of sand, and all the resistance to be overcome are equally great to the small as to the large insects, and it needs greater relative strength to give the small ones a fair chance in the "struggle for existence" with their larger associates.

But these facts and conclusions give rise to other questions which are not so easily answered. Since insects are stronger than other animals, on what food do these small Cæsars feed that they are grown so strong? Is their physical organization formed on different mechanical principles? Have they power of creating or utilizing greater force from the food they eat? Their food, being animal and vegetable, does not seem to differ materially from the food of other animals; and they seem to use the same mechanical powers in their motions. They are, in the perfect state (in which state they manifest their great strength), as a rule, very small feeders, and some eat even nothing. As their strength must come from the food they eat, the question as to how so much can come from so little is as interesting as it is difficult. So far as we know, no attempt has ever been made to determine the laws of the relations between the amount of food consumed and the strength which it generates. The difficulties are perhaps not insurmountable; but one great disturbing element would probably appear in the fact that insects may store up force in their earlier stages which they use in the perfect state.

RAPID TRANSIT IN NEW YORK.

A commission, appointed by virtue of a recent law of the State legislature, is now holding sessions in this city to determine upon the best plans for city steam railways. Formerly it was considered that the underground method was by far the best for a narrow and crowded city like New York, as it occupies no portion of the street surface, is out of sight, occasions no disturbance by its operation, and furnishes the most abundant accommodations for speed and the largest traffic. In those days the proud New Yorker had determined to have the best and most substantial railway works that could be built. But that was prior to the Tweed and other robberies, before the debt of the city had been swelled to over a hundred millions of dollars. Cheaper structures, it is now supposed, will answer, and on this account the elevated plan has come to be looked upon with special favor.

At a recent sitting of the Commissioners, no less than thirty different plans for rapid transit were presented, all of which were for elevated tracks except one, the latter being for a canal railway between the buildings, with bridges or tunnels for the street crossings.

All of these elevated plans involve the placing of bridge structures of some sort, in several of the principal streets; and there appears to be a peculiar unanimity among the citizens on the subject. Nearly every person is in favor of such roads, but no one wants it to run in his street or in front of his store or dwelling. The Sixth avenue people think that an elevated railway is greatly needed, and will do their share toward its construction, provided it is erected on Seventh avenue. The Seventh avenue people are equally in favor of the bridge, but are ready to rise in arms if their magnificent thoroughfare is disfigured with it; they are clearly of opinion, however, that Eighth avenue is the proper place for it.

The road must also cross the town somewhere, and those who reside on 42d, a fine broad street, are in its favor, provided it is erected on their neighbors' premises, a quarter of a mile distant, say, on 37th street; and they are of opinion that the constant passing of cars and locomotives in front of the second story windows of their friends down there will improve their prospects and healths, which now suffer by reason of too much quietude and seclusion.

To satisfy the public will be an apparently difficult task for the new Commissioners; but we wish them success. They will doubtless find out, before their labors are finished, that the building and equipping a first class substantial railway for rapid transit, capacities being equal, is just as expensive on the elevated as on the underground plan.

In the neighboring city of Brooklyn, the projected elevated street railway is also accepted with pleasure by the people. "But when the route of the proposed road is mentioned there is," says the New York *Herald*, "at once a persistent and screeching dissent. Property holders on Myrtle avenue come forward and scream against building the road on that avenue."

A CITY ONE HUNDRED AND EIGHTY THOUSAND YEARS OLD.

In the current number of the *Overland*, a Californian geologist reviews the geological evidence of the antiquity of a human settlement near the present town of Cherokee in that State, and estimates the age of that most ancient of discovered towns to be not less than 180,000 years!

The data for all such calculations are necessarily uncertain, as they are derived from the present motions of the continents and present rates of erosion: still, from the changes that have taken place since the pioneers of prehistoric California left their traces on its ancient sea shore, there can be no doubt that thousands of centuries must have come and gone.

The traces in question are numerous stone mortars, found in undisturbed white and yellow gravel of a subaqueous formation, not fluviatile, underlying the vast sheets of volcanic rock of which Table Mountain is a part. In one instance a mortar was found standing upright, with the pestle in it, apparently just as it had been left by its owner. In some cases the mortars have been found at the depth of forty feet from the surface of the gravel underlying Table Mountain. The distribution of the mortars is such as to indicate with great positiveness the former existence of a human settlement on that ancient beach when the water stood near the level at which they occur: a time anterior to the volcanic outpouring which Table Mountain records, and anterior to the glacial epoch.

The recent geological history of that region may be briefly summed as follows:

Previous to the placing of the mortars in the position in which they have been found, the early and middle tertiary sea level had receded to the position of the coal beds underlying Table Mountain, fully one thousand feet below the level of Cherokee. Subsequently, in the pliocene period, there was a further subsidence of about fifteen hundred feet, something like six hundred feet occurring after the mortars had been abandoned. All this, as has been noticed, took place before the volcanic outflows which covered up all the ancient *detritus* of the region, including that of the ancient rivers (whose gravels have furnished so much of the gold of California). The geological age of the river period was determined by Lesquereux from specimens of vegetation, now extinct, collected in the survey of the ancient rivers: specimens indicating a flora of the pliocene age, retaining some characteristic miocene forms

After the volcanic period, the land rose again, the time of emergence embracing the glacial period and the new eroding period in the sierra, during which the slates, and the hard metamorphic greenstones, and the granites were slashed with cañons three thousand feet deep by the action of ice and running water. Taking the rates of continental movement determined by Lyell, our geologist calculates that the time required for the changes thus outlined could not have been less than eighteen hundred centuries. For a period so long preceding the glacial epoch as the time when ancient Cherokee was buried by the waters of the advancing sea, his estimate is certainly not extravagant, though it does transcend so enormously the time men have been accustomed to allow for man's residence on earth.

APPARITIONS.

From time to time, as there was occasion, we have referred to the so-called revelations of modern spiritualism, to the discovery of gross imposture in connection with the same, and to the strange hallucinations, in regard to this subject, which have overtaken even men who have no mean pretentions to the name of scientists. We have just seen a *resumé* of the history and theories of supernatural appearances and influences, in the second volume of the new edition of the *Encyclopedia Britannica*, a work which is generally regarded as an unusually high authority. The article to which we refer traces the origin of and reasons for superstitious beliefs, considers the evidence for the reputed appearance of ghosts, and concludes with the principal arguments for and against the creed of the spiritualists. The writer of the article evidently considers the strength of the argument, in favor of spiritualism, to consist in the character of a few of its supporters, men like Mr. Wallace and Mr. Crookes in England, and Robert Dale Owen in this country. Reference is made to the experience of Mr. Crookes, who not only saw a spirit, but clasped it in his arms, and thus demonstrated its substantial existence; and the conclusion to the whole matter is that spiritualism, even if its principles are not fully proven, is still a fair subject for scientific investigation, with a reasonable presumption in its favor.

We have referred to this article in the *Encyclopedia Britannica* because an opinion, such as that cited above, in a publication of such high standing, is worthy of more than passing notice. No matter how wonderful the events that are related by the fanatics who generally make up the congregation of spiritualists, their revelations have little effect on any one outside the circle of their immediate followers; but let a man of some scientific attainments, and, moreover, a member of the Royal Society, add his testimony to the truth of these events, and we see that he may deceive even the very elect. It was generally understood, when the last edition of the *Encyclopedia Britannica* was announced, that it was to be scientific in the best sense of the term, and, while giving due weight to popular beliefs and superstitions, that it would endeavor to sift away the chaff with which many of them are enveloped, and reveal their real character. We are to understand, then, from the article under consideration, that such investigations as have been made by some of the more distinguished converts to spiritualism can properly be classed under the head of scientific experiments, which, while not perhaps absolutely conclusive, leave the matter *sub judice*. When we remember the character of the evidence on which all the modern miracles depends, the difficulty if not impossibility of making a thorough investigation with the facilities afforded at a *séance*, and the complete exposure of all the notorious cases of spiritual visions, our readers will probably venture to doubt whether the treatise on "Apparitions" in the *Encyclopedia Britannica* either gives a clear understanding of the actual facts connected with spiritualism, or represents in any sense the views of scientists generally in regard to the matter. No mention is made, for instance, of the exposure of the Katie King fraud in this country, while the vision of this airy being, produced in England under the auspices of the same mediums, is given as one of the strong arguments for allowing spiritualism to have a standing among scientific men. For our part, we can say that we have never heard of any event at a spiritualistic *séance* that at all approached the movements of the wonderful Psycho, in London, whose *rationale* escaped detection for months, with exhibitions in open day, and with apparently every facility for investigation that could be desired.

PROSPECTS OF SCIENCE ON THE PACIFIC SLOPE.

The conditions for the advancement of Science beyond the Rocky Mountains are peculiarly favorable. The country itself presents an exhaustless field of research in every department of the physical and vital history of the world. Its records of continental upheaval and subsidence, of ancient rivers and vanished seas, of vast volcanic outpourings and vaster scenes of erosion, are wonderfully full and legible. In the beds of its tertiary lakes are the remains of multitudes of the progenitors of recent forms of animal and vegetable life—inexhaustible mines of material for the solution of the great problems of evolution. On the shores of those lakes and rivers dwelt the most ancient races of men that geology has furnished glimpses of. Already abundant traces of them have been discovered in and beneath the later tertiary strata, and it is not unreasonable to hope that future observation may connect them with the post-glacial founders of the civilizations which grew up along the valley of the Colorado, before that strange river had sunk its channel a mile below the surface of the plain it once watered, probably before the Nile spread its first layer of fertile soil over the foundation sands of ancient Egypt. Chemical geology has already been immensely furthered by the knowledge gained through the mining operations of the interior and the investigations they have inspired; while the demands for men of scientific training, incident to a country so largely given to mining, have secured to the Pacific Slope a proportion of scientific observers unequaled in any other country.

In older communities, Science and scientific thinking have to contend with the conservatism of custom and the traditions of scholastic culture; in the far west, where scientific training has been at a premium from the first, where public prosperity rests so largely on scientific operations, Science is likely to get more than its fair share of encouragement, rather than less.

In proof of this, it is necessary only to contrast the financial condition of the California Academy of Sciences with that of our eastern societies of like character. It is true that something more than money is needed for productive investigation: the natural and social conditions must be favorable, and there must be no lack of men of proper zeal and training to undertake the work. In this respect, as already noted, the Pacific Slope is as greatly favored as in its abundance of wealth; and only the grossest mismanagement of their means and opportunities can prevent the richest harvest of scientific achievement by the Pacific scientists, whether independent or connected with the California Academy.

The magnificent scope and execution of Mr. Bancroft's research, in connection with the native races of the Pacific coast, afford at once an illustration of the western way of working, and a model of thorough scientific investigation. We shall be greatly disappointed if Mr. Bancroft's work does not prove to be the first of a long series of correspondingly valuable researches in other departments of knowledge, undertaken by the scientific workers of the west. Hitherto their work has of necessity been chiefly of a practical, money-making sort. It has given them the best possible training for the conduct of investigations of broader scope and remoter profit. The work lies ready at hand; and it is safe to predict its prosecution with true western vigor and thoroughness.

DANGERS OF CHLORAL DRINKING.

Blessed be the man that invented sleep, said the immortal Sancho Panza. When the primary physiological effect of chloral was first made known, thousands called down equal blessings on the man who discovered that simple and seemingly harmless sleep compeller. No matter what cares made life a burden, no matter what excitements or excesses made a stranger of "tired Nature's sweet restorer," here was a painless key to the soothing realm of Morpheus, with no apparent penalties to pay for the invasion. It is not surprising, therefore, that chloral soon came to be employed, without medical direction, to a greater extent than had ever been the case with any other sedative.

But experience has not justified the implicit confidence reposed in it. Its apparent harmlessness only made the insidious effects of its daily use the more dangerous. Though it might not kill directly, it too frequently enabled death to take place from causes that would not have been immediately fatal without the sedative influence of the drug on processes needful for life; and not infrequently the machinery of life came to a stand under its influence when no other disturbing cause could be detected: more frequently, perhaps, the *Lancet* avers, than with the use of any other sedative except chloroform, with which it has many chemical and a few physiological relations. The danger of premature death, however, is not the gravest consequence of chloral drinking: and the *Lancet* editorially predicts that some day, when the punishment for the misuse of the drug falls upon some sensitive temperament and gifted intellect, we shall have the "Confessions of a Chloral Drinker," to take its place beside De Quincy's "Confessions of an Opium Eater."

There seem to be two sources of danger attending the habitual use of chloral. The most obvious arises from the fact that the sleeplessness which it is employed to remove is the result of improper living. The proper cure for the distressing symptom is a return to right living, which will never be done so long as the penalty is masked. Instead of curing the disease, chloral simply hauls down the danger signal and permits the wrong doer to hurry on to complete destruction. It is thus a delusion and a snare.

But this is not the worst. Chloral is itself a serious disturber of the vital economy, though its action is very slow. Healthy life is the attendant, if not the effect, of a properly balanced and correctly working organism. Any tampering with our physiological machinery, more especially if habitual, is of necessity mischievous; and the practice of chloral drinking is such an interference. We see its immediate effect in the phenomena of sleep; and there is an analogy, as the *Lancet* points out, between the temporary effect of a single dose, and the permanent effect of its habitual use.

"In sleep, the sensory recipient and lower motor centers are separated from those of consciousness and will with which, during the waking state, they are in close connection. This separation can take place only under certain conditions, which vary much in different individuals. Chloral introduces an artificial influence, and separates forcibly those functions of the nervous system which would otherwise have been linked together. It stills unpleasant emotion—removes disagreeable sensation—paralyzes the will. This can hardly occur repeatedly without some permanent effect. Each region of its influence presents an example of perverted action. The will becomes weakened, emotional manifestations are in the chloral drinker more easily produced; the evidence of the senses is perverted, and their action is no longer under the same control of associated impressions. All influences of a depressing character are felt more keenly. The sufferer becomes more 'nervous,' emotional, hysterical. Neuralgia and other sensory disturbances become frequent, and with them various paretic phenomena depending chiefly on defective will. Ultimately still graver consequences may result. Delirium, imbecility, and paralysis of the pharynx and œsophagus are among the symptoms which have occurred in recorded cases, and which have ceased when the habitual dose was discontinued. All the time the supposed need for sedatives increases, the craving therefor may become as intolerable as for opium—the patient moaning for chloral which he can hardly swallow—while sleep gradually becomes impossible, except under artificial influence."

This is a serious showing for a drug popularly believed to be absolutely safe and harmless. And when we add, to its direct injuries to the nervous system, its indirect influence in perpetuating the unsanitary conditions and habits which lead to a resort to it, the need of caution in its use and the propriety of abstaining from its use except under medical advice must be apparent to the dullest.

COLLEGIATE RACES.

Now that the excitement of the intercollegiate regatta has waned, there will, we think, occur to many some sober second thoughts, regarding that and all similar competitions, which deserve more than a passing consideration. Physical pluck and endurance will always command admiration; but whether such qualities are to be considered superior to others which involve the higher attributes of the mind, so as to warrant their cultivation in lieu of or to the detriment of the latter, is a question which quickly suggests itself in view of the relative importance popularly accorded to the recent display of physical strength and to the several college commencements which lately have occurred. If the columns of the daily press are to be taken as an index, the meager space allowed to the reports of the latter exercises, and the almost unlimited enterprise exhibited in securing the most trivial particulars relative to the boat race and its participants, show plainly on which side popular interest is enlisted. Are we then to infer that superiority at the oar, or on the race course, is by the friends of education, as well as by the people generally, ranked higher than superiority in mental attainments? We hope not—we believe not—but then, are we not tacitly at least encouraging such a conclusion in the minds of the young men who fill our colleges?

There can be no gainsaying the fact that a certain amount of physical culture is a necessary concomitant to good health. A well balanced and healthy brain is rarely found in a weak and decrepit body. *Mens sana in corpore sano* is a wretchedly trite proverb, but none the less true; and certainly there is no class to whom its precept is more important than to those who in youth undertake a four years' course of study. But physical culture carried to excess is as bad as no culture at all, or even worse, since it may leave behind it, after severe exertion, injuries which are ineradicable: or Nature, strained beyond endurance may give way in the hour of trial, and, as in the case of Renforth the oarsman, death may triumph in the midst of the contest. Every account of the recent regatta and the subsequent foot races agrees in stating that, in very many cases, the marks of over training were apparent, facts abundantly proved by the fainting of some of the most muscular rowers, and by the pitiable condition in which, it is reported, several of apparently the strongest of the pedestrians concluded their efforts.

While it cannot be expected that young men will fail to be carried away by their own and by the intense popular enthusiasm manifested in these competitions, and thus rush to extremes both in the matter of physical exercise and in neglect of other duties, it is not to be supposed that the older and wiser heads of college authorities and of parents will countenance proceedings fraught with bad results. To the former, especially, the public looks for a wise guidance of those under their charge; and it is certainly as much their duty to impress upon their students the laws which govern health and correct living as those which underlie any department of knowledge. It certainly is their office to point out how far physical culture is beneficial as it is to show that its neglect is hurtful—to check it in one case as to encourage it in the other.

We are very much disposed to question the expediency of such contests as those now ended, and from another and different standpoint from that above taken. Their only advantages are an increase of *esprit de corps* among the students and the bringing of our educational institutions prominently to public notice. These, however, are more than compensated for by the highly demoralizing effect which they possess, in common with all races or chance occurrences upon which gambling can be based. It certainly is demoralizing for any body of men to be reduced to the level of the race horse or the dice box; and the fact that betting is not only indulged in freely by the students themselves, but freely countenanced by the alumni, is not at all calculated to improve the moral tone of the institutions in which young men are supposed to obtain the foundations for their subsequent careers.

The New York Dock Department.

George S. Greene, Jr., C. E., has recently been appointed Chief Engineer of the Dock Department of the city of New York, General Charles K. Graham having resigned. Mr. Greene, although comparatively young, is an indefatigable worker, a thoroughly practical, experienced engineer, and a man of spotless character. The appointment reflects credit upon the Commissioners by whom the selection was made The administration of the Dock Department devolves upon a board of three Commissioners, namely, Salem H. Wales, formerly of the SCIENTIFIC AMERICAN, President, Jacob A. Westervelt, and Henry F. Dimock, all of whom are leading and influential citizens

IMPROVED AIR RESERVOIR.

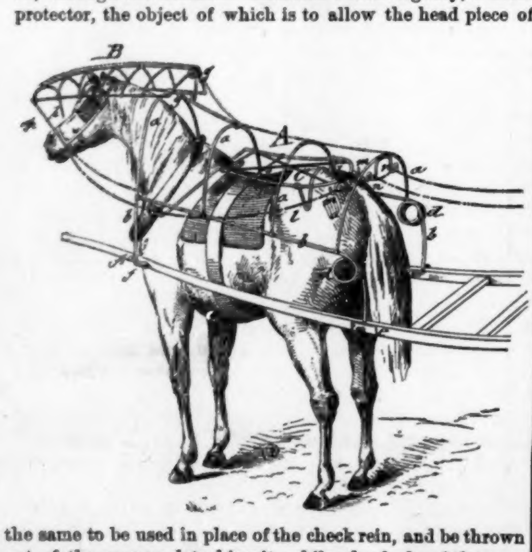
M. A. Galibert, of Paris, France, has recently patented in this country respiratory apparatus, consisting of an air reservoir made of a skin, india rubber, or any other airtight material, in which pipes are suitably arranged for inspiring and expiring the air from and into said reservoir.

The apparatus is intended for furnishing pure air for breathing in localities where vitiated air, smoke, etc., render the atmosphere unfit to sustain life. The engraving represents the airtight bag. Two rubber or other flexible pipes penetrate to the inside of the air bag—one fastened near the top and the other dropping to a point near the bottom. These pipes, after passing to the outside a certain distance, are fastened to the mouthpiece, which is so shaped as to fit inside of the mouth, to be held by the help of the teeth and lips. Two straps are fastened to the air bag, and by them it is carried by the bearer.

In use the air bag is inflated with bellows. When full, the tubes are stopped by a pressure with the fingers, or by twisting them so as to arrest the escape of air from the bag. The bag is now strapped to the back, the nose stopped with spring pinchers or otherwise, the mouthpiece is inserted between the lips, the pipes relieved from pressure, and the apparatus is now ready for use.

DEVICE FOR PROTECTING HORSES.

Mr. R. P. Lawton, of Oramel, N. Y., has recently patented, through the Scientific American Patent Agency, a horse protector, the object of which is to allow the head piece of the same to be used in place of the check rein, and be thrown out of the way on detaching it, while the body of the protector is so applied to the thills that the horse may be readily unhitched without being hindered thereby. The reins are guided and supported in such a manner that no entangling of the tail with the same is possible.



In the engraving, A represents the main part or body of the horse protector, which is constructed in the usual manner of lateral bent wires, *a*, applied to longitudinal supporting wires, *b*. The net, blanket, or other article used for protecting the horse against flies, storms, sun, etc., is placed over the main frame, A, and supported by the same and suitable stiffening wires, which are stretched to connect diagonally over the bent pieces, *a*. The longitudinal supporting pieces, *b*, are bent at their rear ends into coiled springs, *d*, and firmly attached by means of socket slots and clamp screws, *e*, to the thills. The front ends of the side pieces, *b*, are bent under right angles toward the thills, and applied by end hooks, *f*, to loops or staples, *f′*, of the thill. The action of the spiral springs, *d*, carries instantly the main part, A, in upward direction, as soon as the front ends of the supporting pieces are detached from the thills, so that the horse can be unhitched without being interfered with by the supporting frame. The head piece, B, is attached to the upper part of the front wires, *a*, in some suitable manner, the connecting wire piece, *g*, being provided with a spiral spring, *g′*, which has the tendency to throw the head piece back on the body, A, unless connected to the bridle. Light wire rods, *h*, connect the front part of the head piece, B, with the bridle, and take thereby the place of the check rein for holding up the head of the horse The spring connection of head piece and body gives sufficient freedom to the head of the horse, that this check arrangement is not onerous to the same. The reins are supported, for the purpose of not getting entangled with the protector or tail, on a separate wire frame, C, which is also in yielding manner applied either to clamps of the harness or attached to the main part, A. The reins first pass along a lateral V-shaped wire, *l*, of frame, C, placed laterally across and resting on the back of the horse, then over rear guide hooks, *m*, of the same, and finally over hooks or eyes, *n*, of the bent rear wire, *a*, of the main frame, A, to the driver, who is thereby enabled to retain full control of the horse. The protector may be constructed of steel wire of sufficient lightness to form a neat and practical attachment to the thills. In using the protector with a double team, in which case the thills are not available, it is necessary to support the same on a standard attached to the hip and back straps, the front ends being fastened into a slot or socket of the hames. The head piece is applied in the same manner in both cases.

NEW CLINICAL THERMOSCOPE.

Dr. E. Seguin, of 17 East 21st street, New York city, has recently invented a clinical instrument for the detection of anomalies in the condition as to heat of the human body. It is a very simple device of merely nominal cost, and is the most sensitive indicator of changes in temperature which we have ever seen. The inventor calls it the clinical thermoscope; and it consists of a glass tube, of a quarter of a line bore, seven inches long, closed at one end by a bulb nine lines in diameter, and flared at the other end. To make it ready for use, the bulb is heated over a lamp or fire, or more readily in a bowl of hot water; and when the air contained in the bu b is heated to a few degrees above the atmospheric temperature, the open end is quickly plunged an inch deep into, and quickly withdrawn from, a bowl of cold water. The drop or two which will have then entered the mouth is seen to run up the tube. If it stops near the bulb, it will be the index of the thermoscope. If it stops sooner, say two or three inches from the mouth, or if it runs into the bulb, the latter was too cold or too hot, and we have to jerk away that drop of water and recommence; three or four trials, to obtain a good water index, take hardly a minute.

Dr. E. Seguin's Thermoscope.

In this condition, the air contained behind the water index makes itself isothermal to the ordinary temperature, and the thermoscope is ready.

It is applied to any spot where an anomaly of caloricity is known or suspected. Its place by preference is in the closed hand. In five to ten seconds the index has attained the maximum hight or fall; and to read it, we note the distance the index drop of water travels, and the time in seconds it takes to reach it. To take more exact observations, a movable scale is attached to the stem, so as to put its lowest figure on a level with the head of the water index; so that the thermoscope is always correct—"which," says Dr. Seguin, "is more than can be said of most of our clinical thermometers."

But with or without a scale, it gives indications of the thermal condition at the start (*a*), and of the volume of heat escaping by radiation (*b*); while by gently blowing on the bulb, it shows the degree of combustion which takes place in the lungs; and other phenomena of heat may be diagnosed by its use.

Without using a scale, an attendant can tell, by application to the affected part of a patient's body, at what hour the index rose quicker and higher, or quicker only, and not so high, etc. Without a scale, too, a physician who well knows his case, and is short of time, can, in less than ten seconds, decide upon the dynamic conditions of the next twelve or twenty-four hours, dependent on the waste of caloricity by radiation—that is to say, life itself in many cases—and prescribe accordingly.

Dr. Seguin recently communicated to the New York State Medical Society the following interesting case, in which the value of his instrument was made apparent:

"Called to a man fallen from a three story hatchway, I found a compound fracture of one leg and a fracture of the skull; and the patient, rather insensible to pain, had full consciousness, with jactitation, with a speck of erotism; his pulse was con fused, temperature 98·5° Fah., in other terms, at the point of perfect health. Was it delusion? No, it was a compound temperature whose component elements escaped the fever thermometer.

"I tried the thermoscope. Put in the hand, it rose, in the axilla it rose more, below the sternum it rose less, in the inner angle of the eye it fell rapidly. The thermoscope had discovered the point where extravased blood was coagulating, at the base of the brain. Thus it became comprehensible that a temperature of 98·5° Fah., the thermal point of perfect health, may in a dying man be a compound temperature, whose composition could be approximated by these figures: 100·3° Fah. of general pyrexia, balanced by 96·7° Fah. of hemorrhagic apyrexia, equals 98·5° Fah. This thermoscopic analysis saved the man further painful manipulations, and he died, as predicted, inside of three hours.

"The thermoscope in contact with the living shows the activity of their caloricity; and in contact with the dead, it ceases to indicate heat only as organic combustion becomes progressively extinct. As thousands have been buried alive, the invention of a true necrometer excites a deep interest, increased, if possible, since cremation was mooted. For some have knocked at their coffins and re-entered the world; but of what use would it be to knock for help inside the furnace? The proof of death is wanted now more than ever, and, if I am not mistaken, the thermoscope gives it.

"I give this simple and costless instrument to my *confrères*, begging them to try it in the spirit of candor which made Biot say: "We must not shun the humblest contrivances, when they can improve or supplement the medical senses."

IMPROVED TREADLE SAWING MACHINE.

We illustrate herewith a sawing machine operated by a treadle, in the engraving of which A represents a sawhorse of the common construction, with side standards and lateral cross pieces of suitable strength, for supporting the weight of the body and the additional parts attached thereto. A platform treadle, B, is pivoted by a cross rod, *a*, to suitable bearings, *a′*, of the side standards above the lateral bottom piece of the same, and made of concavo-convex shape, for giving a firmer hold to the feet of the person operating the machine, and preventing, also, the contact of the under side with the ground. The treadle, B, is extended to one side to project beyond the horse standard, and provided with an inclined lever arm, C, which is rigidly braced to the treadle, and connected by its curved extension, C′, with the bifurcated end of the saw frame, D. The rear part of extension, C′, is connected to a pivoted lever rod, *b*, with a crank wheel shaft, *d′*, and balance wheel, *e*, at the opposite side of the saw horse, with shaft, *d′*, turning in suitable bearings of the same. The balance wheel is weighted at one side for the purpose of carrying the crank wheel into position to be readily moved by the treadle and arm, avoiding the position of the same on one of the dead points for starting. The forked end of said frame, D, is adjustably pivoted to the rear end of the extension, C′, and reciprocating motion imparted to it by the arm and extension, C C′. Said frame, D, is made in a curved shaped, in any approved manner, with a saw blade cutting in both directions, clamped adjustably and detachably therein. A rear extending arm, E, is bolted to the upper part of the sawhorse, A, serving for guiding the saw frame along the same, it being held in forward position for the sawing by a pin, *f*, of the same, and in rearward position, when thrown back for adjusting the log, by a spring hook, *g*, near the outermost end of the arm, E. A V-shaped piece, F, corresponds in shape with the upper legs of the sawhorse, A, and slides by a groove, *h*, on the main cross piece of the sawhorse, and by a sleeve-shaped perforation, h^2, in a lateral guide rod, h^1, of the upper part of the saw horse. Crotch or piece, F, serves to support sticks or logs of lesser width than the sawhorse, by being carried between the side standards into the required position.

The machine is operated by rocking the treadle platform with the feet, pressing with one hand the upper part of the saw frame, and feeding with the other hand the sticks to the saw.

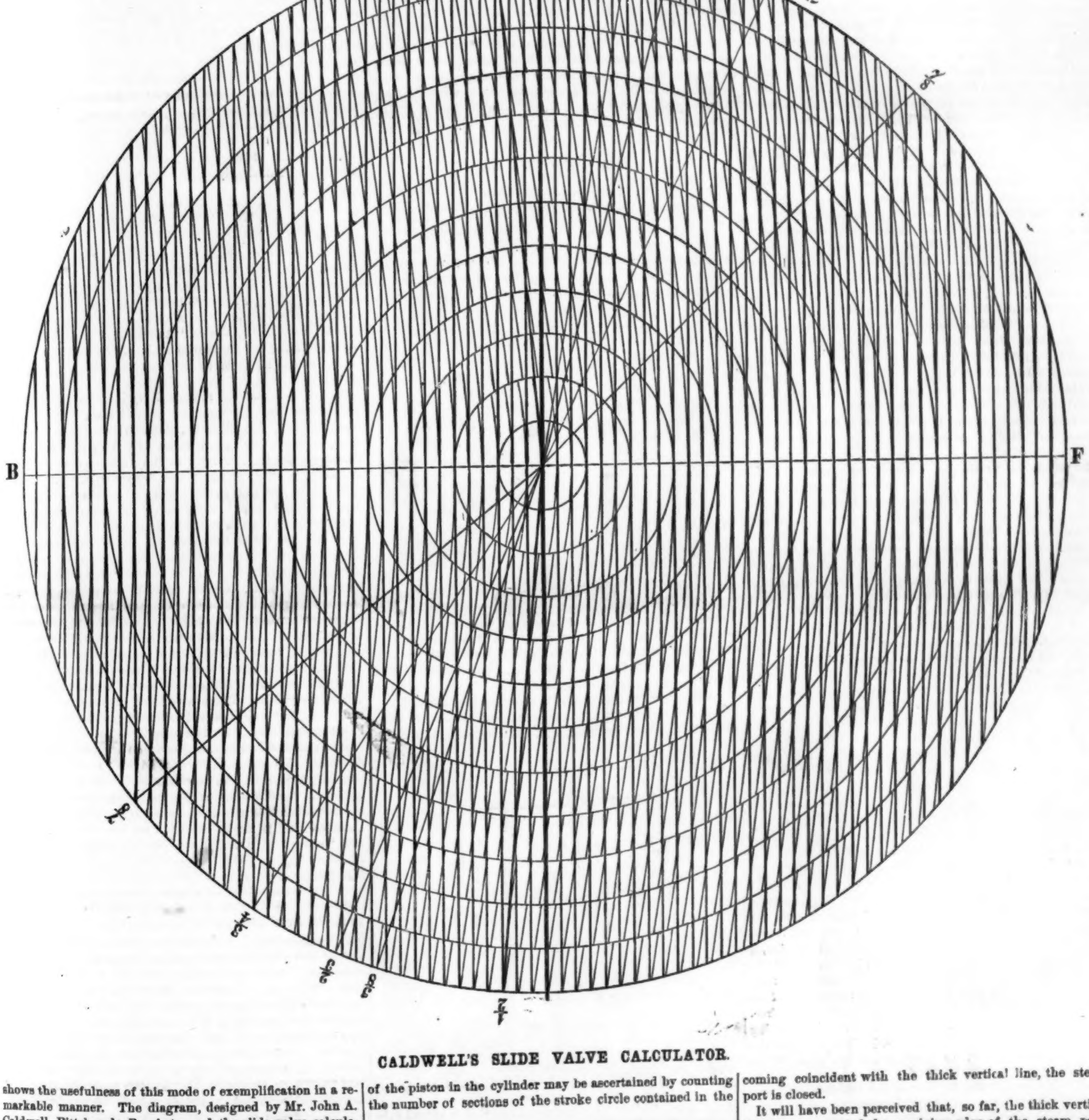
Mr. John M. Linnell, of Monticello, Iowa, is the inventor, and the invention was patented through the Scientific American Patent Agency.

CHEMICAL FILTER.—Place inside of the glass funnel used a small filter of parchment paper pierced at the bottom with a fine needle; afterwards place the ordinary filter in the funnel, and filter as usual. Such cones of parchment paper can be used in any required size, are easily obtained, and may be applied to almost all purposes where the more expensive platinum cones have hither been used.

CHLORIDE OF BARIUM, as a remedy for boiler incrustations, gives general dissatisfaction.

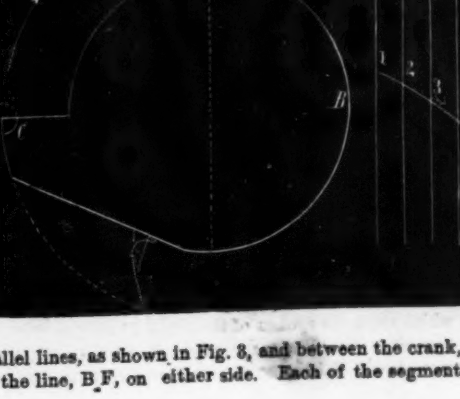
IMPROVED SLIDE VALVE CALCULATOR.

There was privately circulated, at the last exhibition held by the Franklin Institute in Philadelphia, a copy and description of a device by which all slide valve calculations are delineated on a diagram. The application of the graphic method to these intricate calculations is very ingenious, and shows the usefulness of this mode of exemplification in a remarkable manner. The diagram, designed by Mr. John A. Caldwell, Pittsburgh, Pa., is termed the slide valve calculator, and it shows the manner in which a given slide valve, of any dimensions and travel, will perform its functions, and it will also give the dimensions of a slide valve necessary to produce any required result. We publish the diagram herewith.



CALDWELL'S SLIDE VALVE CALCULATOR.

The method of its application is as follows: Cut out a paper template, as shown in Fig. 2. The circle, A, represents the stroke of the engine, one eighth of the full size, and the circle, B, the travel of the valve, of the full size; so that, for an engine having a piston stroke of 24 inches and a valve travel of 2 inches, the circle, A, would require to be 3 inches, and the circle, B, 2 inches in diameter. The quarter circle, C, represents one quarter of the crank pin. After placing the calculator before you in such a position that the letters B and F will read from left to right, pass a pin through the center of the template, shown in Fig. 2, and also through the center of the calculator. Their centers being thus coincident, turn the template until the center of the crank pin stands toward B on the line B F. On the template, and coincident with the perpendicular thick line on the calculator, make the mark shown in Fig. 2 at the point, T, and turn the template in the direction of the arrow until the mark reaches the next vertical line on the calculator, toward F; then, theoretically, the valve has opened the steam port ⅛ of an inch. When, still moving the template in the same direction, the mark on the template has got round to the line, B F, the steam port is fully open, and the crank pin has made one half of a stroke or one quarter of a revolution. The position of the piston in the cylinder may be ascertained by counting the number of sections of the stroke circle contained in the



parallel lines, as shown in Fig. 3, and between the crank pin and the line, B F, on either side. Each of the segments 1, 2, and 3, of the stroke circle represents 1 inch of piston movement.

Moving the template further round, the mark returns; and when the next vertical line is reached, the steam port is closed to the amount of ⅛ of an inch, the port gradually closing as the template is moved forward until, on the mark becoming coincident with the thick vertical line, the steam port is closed.

It will have been perceived that, so far, the thick vertical line has represented the receiving edge of the steam port, and that the point, T, on the template has represented the receiving edge of the valve; and as the valve had no lap, the crank pin is then to be considered on the dead center line, B F.

We must now assume the thick line to represent the exhaust or inside edge of the steam port, and the mark, T, to represent the exhausting or inside edge of the valve. Proceeding to turn the template round again, when the first vertical line, on the B side of the thick line, is reached, the exhaust port is open ⅛ of an inch (providing the valve has no inside lap, for, if it had ⅛ of an inch of inside or exhaust lap, the mark, T, would have just reached the thick line or the edge of the port); and when the mark reaches the line, B F, the exhaust will be open as much as this amount of valve travel will allow. Turning the template again, the approach of the mark, T, toward the thick line represents the closing of the exhaust, until the two become coincident; then the exhaust is closed and the engine has made one revolution, the crank pin being again on the dead center, and the mark, T, at the thick line, from which positions they respectively started.

A valve constructed thus would read:

Travel of valve	2 inches
Cut off	0 "
Exhaust from end of stroke	0 "
Expansion	0 "
Cushion	0 "
Lap	0 "
Steam port opens	1 "
Exhaust port opens	1 "
Lead	0 "

In other words, our example has been upon a valve without either excess of travel, steam lap, or exhaust lap or lead.

We will now give an example of the use of the calculator for valves having lap:

Diameter of cylinder is 12 inches, stroke 24 inches, ports 12 × 1¼, which is equal to one tenth of the piston area. Steam supply to the cylinder is to be cut off at ⅔ of the stroke, and the exhaust is to commence when the piston has traveled to within 3 inches of the end of the stroke. Travel of valve is 2¼ inches, the cushion being a result to be determined. Commencing, then, when the valve is on the dead center line, B F, and (as before) on the B end of it, the valve has to be moved ahead to allow for the lap and give steam when the crank pin is in that position. This is done by making the mark, T, on the template in advance, to the amount of the lap from the thick line toward the F end of the line, B F. If we had not known the requisite amount of lap required to cut off at ⅔ of the stroke, we would have to try, say, ⅝ of an inch, and alter it more or less as we found it to cut off too early or too late; but in our experimental case, ⅝ *plus* $\frac{1}{32}$ of an inch is the requisite lap, and we accordingly make our mark on the template that much in advance toward the F end of the line, B F, of the thick line. If the template be now turned, it will be found that the steam port is opened $\frac{7}{16}$ of an inch; and when the mark has arrived at the identical spot it started from (but on the under side of the line, B F), it will be found that the crank pin stands at the ⅔ line, and the piston has proceeded ⅔ of its stroke. The exact distance in inches can be found by counting the curved lines, from F back to the crank pin, along the stroke circle, each space representing 1 inch. It will be found that there are 8 of them, and 8 inches is the distance the piston is from the end of the stroke.

The proper way to find the inside lap is to move the mark around ⅛ of an inch at a time, and at each movement stop and examine the position of the crank pin to see if it is nearing the desired exhausting point. In this case, ⅛ of an inch would bring the mark to within $\frac{1}{32}$ of an inch of the fourth line from the thick one, and the crank pin is some distance yet from the third inch from the end of the stroke (the exhausting point). This shows that ⅛ of an inch inside lap is not sufficient. We then try the addition of another ⅛ of an inch inside lap, and find that the mark is within $\frac{1}{32}$ of an inch of the third line, and still the crank pin is not at the desired spot. We therefore try the addition of another ⅛ of an inch, and examine, and then another, in all ½ of an inch, and find that the crank pin wants a little yet; but by moving the mark another $\frac{1}{32}$ of an inch, we find, by counting as before, that the crank pin has arrived at 3 inches from the end of the stroke. Now it is evident that further movement of the mark will result in opening the exhaust. When it has arrived at the line, B F, the exhaust will be fully open; and when it arrives at the same line again (but on the upper side of the line, B F), the exhaust will be closed. We proceed to move it accordingly, but we may as well observe how much said port is open when the piston is at the end of the stroke. By proceeding as before, counting one ⅛ of an inch after another, we find 6 of them are passed before the piston is at the end of the stroke, showing that the exhaust is ¾ of an inch open by the time the crank pin is on the dead center line. We may now see if the exhaust port is going to be fully opened or not. The mark was ⅛ of an inch from the thick line when the exhaust port began to open, and it will not be fully open until the mark has arrived at the line, B F. Now the space intervening measures 1⅜ inches, whereas the port is only 1¼ inches wide, consequently the valve travels not only over the port, leaving it fully open, but ⅛ of an inch beyond it, showing the exhaust to be sufficiently free.

Now by moving the mark round to the line corresponding to the opening of the exhaust, namely, ¼ of an inch from the thick line, we find that the crank pin stands at 1¾ inches from the end of the stroke, as the curved lines show 1¾ inches; this, then, is the amount of the cushion. If more cushion is desired, we go over the same ground, after having added a little more inside lap; but this amount, with slight lead, would run well at a piston speed of 300 or 400 feet per minute. Lead would have the effect of opening the exhaust sooner, and of reducing the amount of cushion; but what was lost in this way would be compensated for, so far as the cushioning was concerned, by the admission of live steam, permitted by the lead before the piston had arrived at the end of the stroke, and when the crank pin was consequently on the dead center. The result given by our last experiment would read as follows:

BACK AND FRONT.

	B	F
Travel of valve	2 1-4 inches	2 1-4 inches
Steam lap	21-32 "	21-32 "
Cut off	8 "	10 "
Exhaust lap	17-32 "	17-32 "
Exhausts at	3 "	4 "
Expansion	5 "	6 "
Cushions	1 3-4 "	1 1-2 "
Steam port opens	7-16 inch	7-16 inch
Exhaust opened at end of stroke	3-4 "	3-4 "
Exhaust port opens	Full *plus* 1-8 "	Full *plus* 1-8 "

The B column denotes the back end of the cylinder, and the F the front end; the latter is found in the same way, only the calculator is turned so that the letters B and F will read upside down.

If it is desired to ascertain what effect lead, obtained by moving the eccentric ahead, will have on the engine, we proceed as before; but when the mark, T, has moved forward to the amount of lead required, we move the template no further until we have made a new mark on the template coincident with the line, B F, which new mark will represent the new relation of the crank pin to the old mark; then throughout the operation we employ this new crank pin in place of the old one. By moving the template back to its old position, that is, till the old crank pin is on the line, B F, the new crank pin will denote just how far the piston is from the end of the stroke when the lead commences to act.

By the aid of our illustrations and the given examples in the method of using it, the calculator cannot fail to be understood and appreciated by those who may require to either ascertain what results are being given by the valve of an existing engine, or the proper proportions of a valve for an engine about to be built. JOSHUA ROSE.

Correspondence.

A Charcoal Battery.

To the Editor of the Scientific American:

I enclose a sketch of a cheap and durable form of battery of considerable power; and for many purposes of experiment this battery may be used to advantage. The current is steady, and there are no unpleasant fumes given off, as in many acid batteries. In Fig. 1, the containing vessel, T, is made of tin,

Fig. 1.

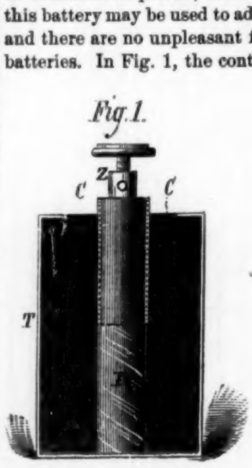
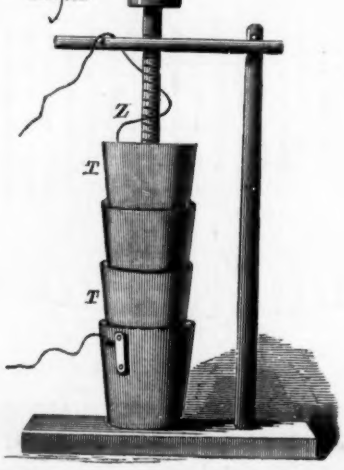


Fig. 3.

into which a rod of zinc, Z, wrapped in canvas, shown at B, is placed. The space between the tin and zinc is then tightly packed with small pieces of hardwood charcoal, C. These cells are charged with a strong solution of potash made in hot water. In making up this battery, the zinc of one cell is connected with the tin of the next. This battery should be placed on an insulating substance.

Another form of this battery is shown in Fig. 2, and a section of two cells in Fig. 3. The containing vessels are made of tin, T T, which are filled with charcoal, A A, to a depth

Fig. 2.



of one or two inches. A piece of canvas, C C, is spread over the charcoal, and on this a plate of zinc, Z Z, is placed. The blocks of wood, B B, are placed on the zinc; a strip of the latter is bent over the blocks so as to connect the zinc of one cell with the tin of the next. In charging these cells, shown in Figs. 2 and 3, the fluid of one cell must not come in contact with the tin of the next; if it be so, the electromotive force would only be that of one cell. The fluid is kept concentrated by placing on the zinc plate of each cell a quantity of potash. JOHN J. BLAIR.

Ardtrea, Ontario, C. W.

The Spider's Web.

To the Editor of the Scientific American:

In your issue of July 3, the question is asked: "How does a spider make its web, the lines of which, crossing at the center, are carried, some of them to the surrounding objects, while others are fastened to an outer circular line, made evidently before the outer circular lines of the woof are formed?" Also: "Where does the spider place itself when it ejects the lines which form the spokes of the wheel?"

The extreme outer line surrounding the web, to which the spokes are fastened, is by no means always circular: this depends upon the position of the surrounding objects to which the web is fastened. The spider first extends lines from one point to another by the shortest route possible, inclosing a sufficient space to build its web; then he extends a line across where he intends to have the center of his web. He next fixes the center by fastening a line thereto on the central line, and, carrying the line at right angles or nearly so to the first line, hitches it to the nearest object, whether that be the outer line of the web, or anything to which the web is fastened. It will be observed here that the spider ejects all the spokes of the wheel (except the first line across the center of the web) from the intended center, placing the first lines at right angles or nearly so, and dividing the distance each time a line is extended from the center until a sufficient number are put up, always stretching the lines alternately in opposite directions until the spokes of the wheel are complete. He then places his left forefoot on the center of the wheel, and hitches the first end of the circular line of the woof to one of the spokes of the wheel, and moves round the center, fastening his thread to every spoke as he goes along, measuring the distance from one line to the other by stretching his right hind foot to secure the web to the spoke, with his left fore foot one line toward the center and moving spirally along from one spoke to the other, until he gets his web sufficiently large for his purpose.

Batavia, Ill. A. M. SPENCER.

The Potato Disease.

To the Editor of the Scientific American:

Having given the potato disease—blight or rot—considerable attention, and made microscopic examinations of the fungus known as the *peronospora infestans* (Berkeley called it *botrytis infestans*), I find that lime is the best cure and preventive. My attention was arrested by the article on page 277, volume XXXII., headed "A Remedy for Potato Blight," referring to the communication of Mr. Lyman Reed, and the process of the action of microscopic parasites attacking the tubers.

It strikes me that Mr. Francis Gerry Fairfield has things a little mixed up. He carefully cleaned the specimens procured by him, and subjected them to heat for 96 hours or more, before he examined them. He finds the ova of the insects on the interior layer of the cuticle of the tubers, and says: "I have no doubt that they commence that *histolytic process* that ends in the destruction of the tuber; but I doubt whether there is any genetic connection between the fungi developed on the stalks in the course of the *degeneration*, and the larvæ in which the *degeneration primarily starts*." The truth of the matter is that these microscopic animalculæ are a secondary product arising in the diseased matter of the tuber. Certain fungi have a nitrogenous substance analogous to diastase, which transforms the starch to dextrin, and finally into sugar, like a ferment, especially under moisture and an elevated temperament, inducing decomposition, forming a *nidus* for the animalculæ. Had he used his microscope to trace the parasitic fungus, he would have discovered the fine threads of the mycelium extending to the tubers, which induces a ferment or gangrenous putrid mass that, like any other animal and vegetable matter, will breed animalculæ in less time than 96 hours. This is easily proved and well known to any one who has given the subject attention. Consequently, his sage advice "to dip the potato, just before planting, in the solution" (carbolic acid), is, to my mind, all nonsense. When the animalculæ or fungi infest the tuber, it is neither fit for use or planting. However, I may err, and it might be well to see the "copious notes," and "always give Mr. Reed the full honor of the first discovery." J. STAUFFER.

Lancaster, Pa.

Utilizing the Grasshoppers.

To the Editor of the Scientific American:

The grasshoppers, desiccated and ground, would of course be useful as a fertilizer; but when in this prepared condition, they would form an excellent food for all insect-feeding birds. There is no better food for all young domestic fowls. Containing silicic acid in a soluble state, they seem specially adapted for young birds, promoting the growth of feathers. The young prairie chicken flies when only eight days old. The sharp-tailed grouse and the cock of the plains subsist entirely on grasshoppers up to their maturity; and after that, they prefer grasshoppers to other food. I have found in the depth of winter, at the foot of the Rocky Mountains, the gizzard and stomach of the sharp-tailed grouse filled with grasshoppers, when they had to find the dead bodies of them under six inches of snow.

There exists, in fact, no beast or bird of prey on the western plains which would not partake freely of them, whenever they are to be procured. I found, in the season when grasshoppers were plentiful, the stomach of the prairie wolf, the stomach of the little kit fox (*canis cinereo-argenteus*), and the gizzards of all *falconidæ* and owls filled with grasshoppers. Even by man they have been and are used as food. The inhabitants of the interior of Africa use them extensively, and the Pau-Eutaws or Digger Indians of our own country find them very palatable. I do not, however, suggest them for the latter purpose. E. WERNIGK

A Theory of Dissolution.

To the Editor of the Scientific American:

The reason given that a solid will be dissolved by a liquid is that the adhesion between the atoms of the solid and liquid is greater than the cohesion of the atoms of the solid.

The reason the adhesion is greater than the cohesion is that the weight or specific gravity of the atom of the solid is less than the specific gravity of the atom of the liquid; and

when the specific gravity of the atom of the solid is greater than the specific gravity of the atom of the liquid, the solid will not dissolve; and when the specific gravity of the atom of the solid is but a little greater than that of the liquid, it will require continual shaking to make it dissolve, or, when dissolved, to keep it from settling to the bottom. The reason that the solid sinks when placed in the liquid is that there are as many more atoms in a given space of the solid than in the same space of the liquid as the weight of an atom of the solid is less than the weight of an atom of the liquid.

It will be noticed that the bulk of the solid that will be dissolved is much less than the bulk of the liquid; which proves that there are a greater number of atoms in a given space of the solid than in the same space of the liquid; for each atom of the solid must come in contact with each atom of the liquid, to make a saturated solution.

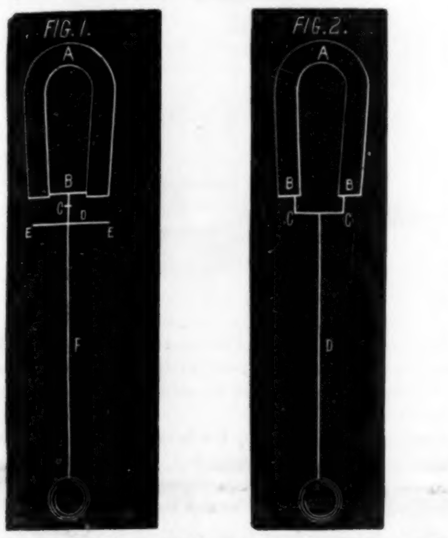
WM. L. DUDLEY.

A Frictionless Joint.

To the Editor of the Scientific American:

Is not the following application of an old principle new, as presenting a minimum of friction?

A, Fig. 1, is a horseshoe magnet, having a brass crossbar, B, between the poles, with a short extension, C, in the end of which is fixed an ordinary watch jewel. F is a pendulum, with crossbar, E E, for an armature, terminating in a needle point, D, resting up against the jewel, C. The weight of the pendulum must be just within the power of the magnet; and as gravity is barely overcome, the needle point only touches the jewel, and the friction is infinitesimal.



However, as pendulums left free to vibrate make a revolution in direction in twenty-four hours, it is possible that, when vibrating from side to side, the magnet would hold the crossbar, etc. This would be obviated in part by making the armature, E E, of a circular plate, and would be entirely so by using the following arrangement:

A, Fig. 2, is the magnet, B B jewels in each pole, C C are the needle points, and D the pendulum. The whole is to be placed under a receiver, and in both cases to vibrate to and from the observer, not from side to side.

Waterloo, Ill. HENRY TALBOTT, JR.

Altitude of Thunder Clouds.

To the Editor of the Scientific American:

In your issue of June 30, Mr. David Brooks of Philadelphia has given an interesting little essay on thunder clouds and lightning. Without assenting to his theory of the manner in which the latent electricity is evolved and discharged, as being at all complete or satisfactory, I am indebted to the writer for recalling to my mind some measurements made by me in 1840-43, by way of attempting to determine the hight of thunder clouds. My results were so great as to keep me in doubt as to the reliability of my method. I repeatedly measured clouds of 6 and 8 miles in altitude, and more than once got 10 miles as my result; and in a single instance I measured the altitude of what turned out to be a terrific thunder and hail storm of 13 + miles in hight. I published an account of this one in the Concordia *Intelligencer*, printed at Vidalia, La. Its limited circulation protected me, as I afterwards congratulated myself, from severe scientific criticism. I now believe it was a reliable result, and the method legitimate. Let me state it that others may test the method, which I do not believe is generally, if ever, used by any other observer.

As the cloud developed eastward of my position, and I had a clear horizon, its great altitude began to be remarkable before its companions (usually found touching at the base and ultimately confluent) had fairly established themselves. The rain was visibly discharging at the center of the base when the thunder began. Both head and base were well defined; and I applied my sextant, when above 45° hight were read. The cloud continued to rise and the electricity to be discharged with rapidity; and the rain descended from both sides when nearly 60° were reached. The defined bases merged into the horizon, and I could no longer depend upon my results. The storm, of course, moved from me, as all clouds of great altitude move eastward in this latitude. I took the dew point, and ascertained the altitude of the base of all the clouds (approximately) by imputing 100 yards for every degree Fahrenheit of difference between the air temperature and the point of condensation, by the wet bulb. This gave about 1,600 yards. At 4°, the elevation of the base of the cloud before me, the sine of the angle of elevation, gave about 40,000 feet for the distance of the center of the thunder cloud; and 60° elevation to its summit gave about 70,000 feet, or 13½ miles. Subtracting the elevation of the base, 3,000 feet, we find some 67,000 feet, or nearly 13 miles, for the cloud hight. Subsequent information proved the storm to have been terrific. Its width was but a mile or two in starting, but it spread as it advanced, and did much damage by floods and wind, and many trees were struck by lightning.

If observers will keep a sextant and thermometer at hand, they will find frequent opportunity during summer of testing the hight of isolated clouds, which pierce and pass far above the cirrous clouds, whose elevation is at the base of the permanent southwest upper current—the reciprocal of the trade winds. The development of the thunder clouds lies along that region, and their heads are always borne off to the northeast by its drift. Hence all tornados, hailstorms, and thunder clouds of considerable magnitude travel towards the northeast in these latitudes, 29° to 33° N. C. G. FORSHEY.

New Orleans, La.

Useful Recipes for the Shop, the Household, and the Farm.

To test the soundness of a piece of timber, apply the ear to the middle of one of the ends, while another person strikes upon the opposite extremity. If the wood is sound and of good quality, the blow is very distinctly heard, however long the beam may be. If the wood is disaggregated by decay or otherwise, the sound will be for the most part destroyed.

Paper prepared after the following recipe is said to render the use of the razor strop unnecessary. By merely wiping the razor on the paper to remove the lather after shaving, a keen edge is maintained without further trouble. The razor must be well sharpened at the outset. First, procure oxide of iron (by the addition of carbonate of soda to a solution of persulphate of iron), well wash the precipitate, and finally leave it of the consistence of cream. Spread this over soft paper very thinly with a soft brush. Cut the paper in pieces two inches square, dry, and it is ready for use.

Photographers will find the following a useful glass-cleaning preparation: Water 1 pint, sulphuric acid ½ oz., b-chromate of potash ½ oz. The glass plates, varnished or otherwise, are left for 10 or 12 hours, or as much longer as desired, in this solution, then rinsed in clean water and wiped dry with soft white paper. The liquid quickly removes silver stains from the skin without any of the attendant dangers of cyanide of potassium.

Adhesive fly paper is made by boiling linseed oil to which a little rosin has been added, until a viscid mass is formed. The latter is then spread evenly upon the paper.

A good red or blue ink, suitable for use with stamps, can be made by rubbing Prussian blue or drop lake with fine clay into a thick paste with water.

A tablespoonful of black pepper put in the first water in which gray and buff linens are washed will keep them from spotting. It will also generally keep the colors of black or colored cambrics or muslins from running, and does not harden the water.

Lime slaked just before application and sown by hand is said to be an infallible protection against fly in turnips.

A whitewash made of quicklime and wood ashes will destroy moss on trees.

A mixture of tallow 3 parts, tar 1 part, applied to the bark while hot, will protect fruit trees against mice.

A cubic yard of sand or earth weighs about 30 cwt; mud 25 cwt; marl 26 cwt; clay 31 cwt; chalk 36 cwt; sandstone 39 cwt; shale 40 cwt; quartz 41 cwt: granite 42 cwt; trap 42 cwt; slate 43 cwt.

In small blasts, 1 pound of powder will loosen about 4½ tuns of rock. In large blasts, 1 pound of powder will loosen 2½ tuns. Fifty or sixty pounds of powder enclosed in a bag and hung against a barrier will demolish any ordinary structure. One man can bore with a bit 1 inch in diameter from 50 to 60 inches per day of 10 hours in granite, or 300 to 400 inches per day in limestone. Two strikers and a holder can bore with a bit 2 inches in diameter 10 feet per day in rock of medium hardness.

A 4 horse team will haul from 25 to 36 cubic feet of limestone at each load.

About 270 cubic feet of new meadow hay, or from 216 to 243 cubic feet of hay from old stacks, or from 297 to 324 cubic feet of dry clover, weigh one tun.

To compute the number of tuns an ice house will contain, calculate the number of cubic feet in the house and divide by 35; this gives the number of tuns if closely packed.

To determine the weight of live cattle, measure in inches the girth around the breast just behind the shoulder blade, and the length of the back from the tail to the fore part of the shoulder blade. Multiply the girth by the length and divide by 144. If the girth is less than 3 feet, multiply the quotient by 11. If between 3 and 5 feet, multiply by 16; if between 5 and 7 feet, by 23, or if between 7 and 9 feet, by 31. If the animal is lean, deduct $\frac{1}{20}$ of the result and the answer is the weight in pounds: this multiplied by 0·605 gives the net weight.

To make a glue which will resist fire, mix a handful of quicklime in 4 ounces of linseed oil and boil to a good thickness; then spread on tin plates in the shade. It will become exceedingly hard, but may be easily dissolved over the fire and used as ordinary glue.

The following are good non-poisonous glazes for common earthenware (1) Silicate of soda at 50° B. 100 parts; powdered quartz 15 parts; chalk 15 parts. (2) The same with the addition of 10 parts borax.

Artificial grapes are blown from melted resin and afterwards dusted with a colored powder.

The best homemade fireproof safe is a hole in the ground, well lined with brick and cement.

To restore the color of a marble mantlepiece which has become stained, mix up a quantity of the strongest soap lees with quicklime to the consistence of milk, and lay it on the stone for twenty-four hours. Clean afterwards with soap and water.

Plaster of Paris mixed with a saturated solution of alum, baked in an oven, pulverized, and lastly mixed with water, is an excellent cement for marble.

Slaked lime, placed loosely on a board inside a furnace during the summer, will take up the moisture and prevent rusting.

Iron in Railway Bridges.

Mr. W. Kent, of the Stevens Institute of Technology, has made some analyses of the rapid corrosion of iron in railway bridges. It has frequently been noticed that iron, exposed to the smoke, steam, and heated gases escaping from passing locomotives, shows a greater tendency to corrode than iron in situations not so exposed. A qualitative chemical analysis of iron rust that was taken from a bridge on the Pennsylvania Railroad showed the presence (in a water solution of the rust) of iron, ammonia, sulphuric acid, and traces of sulphurous acid and chlorine. A separate portion of the rust was tested for carbonic acid, which was found in considerable quantities. The escaping gases from the locomotive contain carbonic acid, carbonic oxide, moisture, and, if there is sulphur in the coal, sulphurous and sulphuric acid. The presence of these acids, no matter in how small quantity, is sufficient to promote rapid corrosion.

New Phenomena of Solar Radiation.

M. Desains has recently examined the variations which the calorific solar rays undergo at the same time in point of intensity and with reference to their transmissibility through water. He expresses the results reached in tables which show the quantity of heat arising at noon during one minute, and at different periods of the year, on an area of 1·6 square inches. The numbers vary very slightly, ranging from 1 to 1·3. The minimum was observed in January, 1875, and the maximum in June, 1874. Another table shows how the quantity of solar heat varies in traversing 0·32 inch of water in a minute, at noon. On April 25th last, the sky being clear, sixty-three per cent of the radiation was transmitted. In June and July, 1874, the proportion reached seventy-two per cent. M. Desain deduces from his results the curious fact that an increased transmissibility of the radiations is related to the presence of greater or smaller quantities of watery vapor in the high atmospheric regions. Facile transmissibility indicates cloudy weather on the following day; and on the other hand, when the reverse is the case, permanently fair weather may be expected.

Aniline Black Marking Ink.

To prepare this ink the following solutions are required: (1) Dissolve in 60 grammes of water 8·25 grammes crystaline chloride of copper, 10·65 grammes chlorate of soda, and 5·35 grammes chloride of ammonium. (2) Dissolve 20 grammes hydrochlorate of aniline in 30 grammes of distilled water, and add 20 grammes solution of gum arabic (1 part of gum to 2 of water), and 10 grammes glycerin. If 4 parts of the aniline liquid are mixed in the cold with 1 part of the copper solution, we obtain a greenish liquid, which may be used at once for marking linen; but as it decomposes in a few days, it is better to preserve the two solutions separately. The writing is at first greenish, but is blackened by exposure to steam (for example, by being held over the spout of a boiling kettle). A dry heat renders the tissue brittle.—*Dr. Jacobsen.*

A Preventive for Shafting Accidents.

There are no accidents more common in large manufactories, and few more fatal, than those caused by the engagement of some portion of a workman's garments with a swiftly rotating shaft. The loose dresses of female operatives are especially liable to become entangled in countershafts placed near the floor, or in the revolving shafting of the machines which they may be attending. There is a very simple way of rendering these casualties impossible, and this without necessitating the usual plan of constructing a railing or fender about the moving piece. It is simply to cover the shaft with a loose sleeve along its whole length. The sleeve may be of tin or zinc and made so as to be removable if desired. The friction between it and the shaft would be sufficient to cause its rotation with the latter, but of course, in event of a fabric becoming wrapped around it, it would quickly stop, and allow of the easy extrication of the same. The sleeve should be lined with leather both within and at the ends in order to prevent noise.

The same idea in the shape of loose covers might readily be applied to cog wheels or pulleys, and thus prove a valuable safeguard against loss of life or limb.

IN describing the fireproof houses now in process of construction in Chicago, Ill. (see SCIENTIFIC AMERICAN of June 19), we noted especially the improved method of plastering which has been adopted—the system involving the use of concrete and other materials, supported by galvanized iron wire. Mr. James John, of La Salle, Ill., we should have stated, is the inventor of the system, which has been patented. Mr. John is therefore entitled to the credit of the invention, which appears to be one of considerable value.

STELLER'S BLIND SLAT HOLDER.

We illustrate herewith a novel and simple device designed to hold the slats of a blind in any desired position. Owing to the shrinkage of the wood, and wear, slats as a rule become loose, so that it is impossible to place them so that a gust of wind will not alter their position. In summer it is always desirable to tilt the slats so as to shut out the sun, or to open them so as to admit currents of air; while in winter, the slats, tightly closed, are an additional protection against the cold.

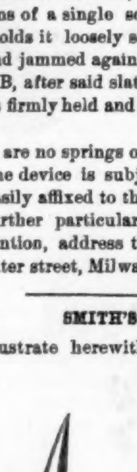
The invention, which is shown attached to the blinds in Fig. 1, and enlarged in Fig. 2, consists of a plate of metal, A, fastened to the stile, and between the latter and the slats, by means of a single screw at its upper extremity. This screw holds it loosely so that it may easily be pushed outward and jammed against the edges of the slats by the cam button, B, after said slats are adjusted as desired. The slats are thus firmly held and cannot be moved or opened from the outside.

There are no springs or other mechanism to get out of order. The device is subject to no hard wear, is ornamental, and is easily affixed to the blind frame.

For further particulars in regard to agencies for selling the invention, address the patentee, Mr. C. E. Steller, 352 East Water street, Milwaukee, Wis.

SMITH'S IMPROVED AWL.

We illustrate herewith a novel improvement in shoemakers' awls, whereby the usual bristles on the waxed ends are rendered unnecessary. The instrument is made with a notch, A, inclined toward the point, and a notch, B, inclined in the opposite direction. The thread has one end inserted in the notch, A, and is pushed through the leather with the awl. Before withdrawing the latter, the other end of the thread is placed in notch, B, and the instrument is retracted. The effect is to form a stitch precisely the same as that made with the waxed ends and bristles, while the cost of the latter is saved. The sewing, we are also informed, is accomplished much more rapidly. The end of the tool is made flat, and the adjacent edges ground sharp, so as to facilitate penetration. The inventor states that he has had this awl in practical use for some time, and that its operation is uniformly successful.



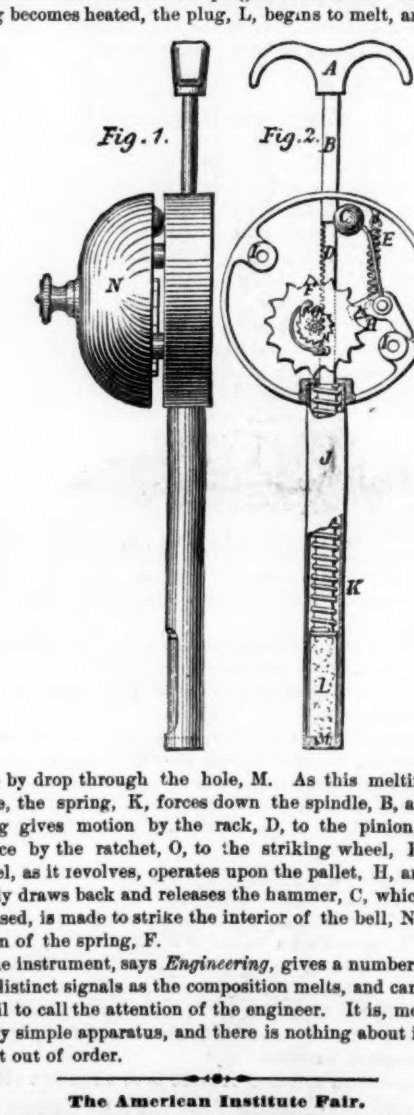
Patented through the Scientific American Patent Agency, March 30, 1875. For further particulars address the inventor, Mr. Sylvester A. Smith, Letts, Louisa county, Iowa.

The Gas Wells of Pennsylvania.

The *National Oil Journal* says: "There is little doubt that the gas escaping constantly from oil wells is of nearly or quite as much value as the oil itself; and it is a matter of wonder that means have not long since been adopted to utilize this immense product of the earth. No estimate can be made of the quantity of this gas, which has for years been allowed to pass away into the air uselessly; but the yield of a few gas wells which have been tubed and their product utilized indicates that it is enormous. A gas well near Sarversville, in the Butler oil region, flows with a pressure of 300 lbs. to the square inch, and is roughly estimated to yield a million cubic feet of gas every 24 hours; and this is only one of quite a number of large gas wells, and almost numberless small ones, for it must be remembered that every well which produces oil also yields gas. A survey has just been completed for a line of pipe from Sarversville to Pittsburgh, a distance of about 17 miles. It is proposed to lay a six-inch pipe between the points named, and to supply the gas to manufacturing establishments as a substitute for coal for fuel in Pittsburgh."

ALLEY'S BEARING FEELER.

We subjoin an engraving of a very useful instrument designed and constructed by Mr. Stephen Alley, of Glasgow, Scotland, for giving a prompt indication of a hot bearing. The apparatus consists simply of a brass tube, J, which is placed in a hole bored in the cap of the bearing to receive it, the bottom of the tube touching the shaft. At one side, near the bottom, the tube, J, is partly cut away so as to admit of the ready insertion of a cylindrical plug, L, formed of a hard grease, or of a composition which will melt at the temperature at which it is desired that the alarm should be given. To insert the plug, L, the handle, A, is pulled so as to draw up the spindle, B, and thus by compressing the spring, K, making room between the bottom of the spindle and the bottom of the tube for the plug to be inserted. If the bearing becomes heated, the plug, L, begins to melt, and escapes



drop by drop through the hole, M. As this melting takes place, the spring, K, forces down the spindle, B, and in so doing gives motion by the rack, D, to the pinion, G, and thence by the ratchet, O, to the striking wheel, F. This wheel, as it revolves, operates upon the pallet, H, and alternately draws back and releases the hammer, C, which, when released, is made to strike the interior of the bell, N, by the action of the spring, F.

The instrument, says *Engineering*, gives a number of clear and distinct signals as the composition melts, and can scarcely fail to call the attention of the engineer. It is, moreover, a very simple apparatus, and there is nothing about it likely to get out of order.

The American Institute Fair.

The usual announcement of the coming American Institute Fair will be found in our advertising columns. The Institute's building on Third Avenue and 63d street will be open for the reception of machinery on August 15. Other goods will be received after August 29. The exhibition will be made public on September 9.

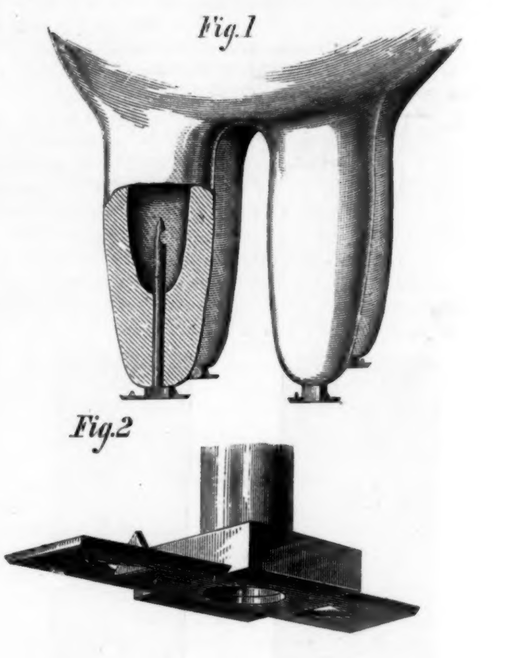
We have come to regard the day, officially fixed, as that on which the Fair is supposed to be complete and ready for public inspection, as a mild species of fiction never by any chance realized. As for the show being then fit for examination or anywise approaching such condition, we have never found it so, and therefore expect no departure from the usual practice this year. The managers lay the blame on the exhibitors, and *vice versa*. The public cares not a straw for the quarrel, but it certainly has a right to demand a respectable exhibition in return for its money; and it justly objects to being deluded into paying fifty cents admission fee, for the privilege of gazing on a muddle of packing boxes, amid the din of hammering and saws.

We counsel intending exhibitors to apply for space at once; and at the same time take this early opportunity to commend the foregoing hint to the Fair managers, assuring them that it would, on the other hand, afford us a lively satisfaction to be enabled to chronicle that the forty-fourth annual exhibition of the American Institute, unlike its predecessors, was submitted to the public on the appointed day, complete.

IMPROVED MILKING TUBES.

Mr. Sylvester A. Smith, of Letts, Louisa county, Iowa, has patented (May 25, 1875) through the Scientific American Patent Agency, a new mode of extracting milk from the udders of a cow or other animal, which consists in inserting into each teat a tube, open at the upper but closed by a valve at the lower end. The annexed engraving shows the construction of the device, which is represented in position on the teat in Fig. 1.

An aperture in the end allows of the entrance of the milk, which escapes beneath and runs into the pail when the simple sliding valve, shown enlarged in Fig. 2, is opened. The tubes do not annoy the animal, which speedily becomes accustomed to their insertion. They are claimed to save all the labor of milking, and to accomplish that operation with



greater rapidity, since the usual squeezing process by the hands is done away with, and to extract every drop of milk which may be contained in the udder. The tubes are neatly made of German silver.

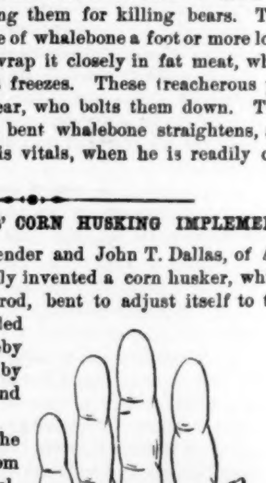
For further particulars, the inventor may be addressed as above.

Ingenuity of the Esquimaux.

The Esquimaux have been credited for having considerable inventive and constructive skill. Their boats are ingeniously made, and their ice huts are arched on correct mathematical principles. A recent writer describes a cruel but novel method in use among them for killing bears. They sharpen the ends of a piece of whalebone a foot or more long, then bend it double, and wrap it closely in fat meat, which is exposed to the air till it freezes. These treacherous pellets are thrown to the bear, who bolts them down. They thaw in his stomach; the bent whalebone straightens, and the sharp points pierce his vitals, when he is readily captured.

CAVENDER AND DALLAS' CORN HUSKING IMPLEMENT.

Messrs. William T. Cavender and John T. Dallas, of Auburn, Kansas, have recently invented a corn husker, which consists in an iron or steel rod, bent to adjust itself to the hand and wrist, and provided with a curved end, whereby the husks are stripped by thrusting the curved end through them.



In the engraving, A is the husker proper, formed from a small rod of iron or steel, bent as shown, so that, when the husker is placed between the forefinger and thumb of the right hand, the end, *a*, of the husker will rest at the under side of the junction of the hand with the wrist; and thence it extends upward, parallel with the thumb, until the end is curved in a spiral form, terminating in a point, *b*. The husker has fitted to it a strap, B, one end of this strap being confined to it in any desirable way, and the other end being provided with a metallic loop, *c*, which hooks into the hook, *d*, at the end, *a*, of the husker. The husker is operated by seizing the ear of corn in the left or right hand, the husker being attached to the other hand in the manner above mentioned; the corn is thrust through the husks, stripping the husk from the ear in a rapid manner and without injury.

ACCORDING to Professor Le Conte, the rate of growth of corals in the Gulf of Mexico is from $3\frac{1}{2}$ to 4 inches per annum.

THE CYCADS.

The *macrozamia plumosa* is certainly one of the most graceful of all cycadaceous plants for general decorative purposes, its green feathery leafage possessing all the freshness and beauty that belong to the most elegant of ferns, combined with the permanence and stately aspect of some of the palms. This fine cycad grows well in a moderately warm greenhouse or conservatory, where, intermixed with other plants, it will prove to be of the utmost service. It has been recently imported from Queensland into England by Mr. William Bull. From a small ovate stem, the scales of which are woolly, rise the erect spirally twisted leaves, which are from 2 to 2½ feet long, and have a flattened petiole. These leaves are furnished nearly to the base with narrow linear leaflets, which are set at intervals of about a quarter of an inch, and are from 6 to 8 inches long. The plant is remarkable for its distinct and elegant character, and will be admired by all our readers.

THE MACROZAMIA PLUMOSA.

Improvement in Soldering.

Dr. A. W. Hoffman thinks it possible that oxygen blowpipes or apparatus might be invented, whereby the soldering of metals, without alloys, can be done. He says: "It would be useful to turn our attention to the autogenous soldering of metals with the aid of the oxyhydrogen flame, a principle which has achieved such signal triumphs in the treatment of two essentially different metals. Should it not be possible, by the same means, to solder every metal and every alloy with itself, as tin with tin, copper with copper, brass with brass, silver with silver, gold with gold, and even iron with iron, just as we already solder lead with lead, and platinum with platinum? The probability is present, and the advantages of such a procedure are manifest. Let us try to conceive the neatness of a workshop in which soldering is performed, not as heretofore, with the soldering iron or at the forge, but with a light, elegant gas burner. Imagine the artisan no longer annoyed by radiant heat and by the fumes of charcoal, and able to produce in a moment any temperature required, even the very highest, and again to put an end to it by simply turning a cock. Conceive the solidity of the soldering which no longer depends on cementing two pieces of metal with a foreign matter, but on an actual interfusion of two portions of one and the same metal, and which involves the utmost economy of materials and dispenses with all subsequent work, such as trimming the soldered place with a file. Such evident advantages must overcome every prejudice, and prompt us most urgently to commence a thorough experimental investigation of the question."

THE FICARIA.

The common ficaria of our woods, with its myriads of polished golden flowers in spring, is well worthy of garden culture. Still finer, however, inasmuch as it is twice as large, is the as yet uncommon ficaria or *caltha grandiflora*. This fine species is a native of southern France, and was introduced some years ago by a gardener, who gave some plants to Mr. Parker, of the Exotic Nursery, Tooting, England, who has since increased it abundantly, and cultivated it with success as a border flower. It is quite hardy, and thrives to perfection in ordinary open border soil. It is, according to a writer of the *Revue Horticole*, as valuable a plant as the spring adonis (*a. vernalis*). Mr. Parker's plants were, during the past spring, 15 inches high, and densely covered with large showy polished golden flowers.

FICARIA GRANDIFLORA.

Dull Times in Great Britain.

The English manufacturers are greatly alarmed at the sluggishness of trade generally. The hardware trade, as well as the iron manufacture, seems to be very slack throughout England, and some of the newspaper writers, in complaining of the lack of orders from the United States, warn their manufacturers against expecting as many orders from this side of the water as formerly, and suggest that they find new markets for their products. One of our English cotemporaries mentions Japan as a good market for their hardware, remarking that the Germans and French now monopolize most of that trade. "In Staffordshire," says one of our exchanges, "the market possesses an element which militates against its general healthiness. In many branches makers are experiencing very keen competition from foreigners. The United States is a formidable business antagonist. By Pennsylvania, padlock and currycomb makers in particular are very hotly pressed, and transatlantic firms are underselling us in bright-headed bolts and nuts to the tune of 20 to 25 per cent. By Belgium we are being undersold in railway spikes to the enormous extent of $25 to $40; and Barcelona (Spain) makers are turning out door locks and hinges at rates which, on this side, seem mythical. And the competition we experience is not restricted to other countries. As in the minor industries, so likewise in the heavier trades, sharp rivalry is seen. Notably, the steam and boiler tube makers are being hard pressed by those of Scotland."

The Foreman.

The duties of the foreman are (like the busy housewife's work) never done. If he is alive to the interests of his employers, he is not the last man in the factory in the morning, neither is he the first one out at night. To him belongs the duty of knowing that every operative is at his work in the morning. To him belongs the duty of knowing that every operative renders unto his employer a just and equitable day's labor. To him belongs the duty of knowing that every operative performs his work to standard perfection. To him belongs the duty of arbitrating justly and fairly between employer and employed, and not unfrequently does it become incumbent upon him to settle various disputes between operatives; in fact, he is or must be, as nearly as possible, an omnipresent *factotum*. He knows of all the little domestic troubles of his subordinates, and has to advise and suggest means of bringing about (amicably) the marital relations of more than one of those under his control; not sufficiently burdened with his own troubles, he carries the troubles and secrets of subordinates securely locked within his own breast. If any of the operatives in his department meet with reverses, he is the first one appealed to; he is the first to add his name to the subscription list for a certain amount; no matter whether he is prepared or not, he must, to prevent calumny, subscribe. Thus we might speak of him on this subject for years, and fill volumes without end, and then not finish this portion of our story.

All employers or factors are not practical men. In such cases, the success of the manufacturing portion of the business devolves wholly upon the foreman. Not only is he held strictly accountable for the superiority of the work, but he must ever tire his never resting brain in producing fresh novelties: novelties which will bring the work to a greater state of perfection, and novelties which will cheapen the production, without lessening the wages of the operatives. If it becomes necessary to reduce force, to the foreman belongs the unpleasant task of saying: "We will have to dispense with your services." If a reduction of wages be determined upon, the foreman becomes the agent for promulgating the same, and if he is not possessed of the necessary amount of tact and eloquence to present the same in such a phase as to prevent the immediate withdrawal of a part or the whole of the operatives employed, his fate is *anathema*.

To become a thorough foreman does not necessarily imply that he should be a thoroughly practical mechanic, or thoroughly skilled in that branch of handiwork over which he is to preside. That he must have a thorough theoretical knowledge of the same is absolutely necessary. He must be intelligent, affable, and favored with an even-tempered disposition. In fact, he must be so favored with all the features that make up the character of man, which will allow him at once to be the engineer, general preceptor, counsellor, judge, spiritual adviser, and friend. He must be above temptation of every kind. His disposition must be such as will allow him to chide a man gently for any fault unwittingly done. He must have firmness enough to demand that justice be done his employers, and courage enough to defend his subordinates against encroachments by his employers. He must be generous enough to advance others' claims or inventions, without coveting them or stealing them. He must be wise enough to know right from wrong, and impartial enough to deal justly by friend or foe. He must be frank in all things, and liberal in all his expressions, and must be humble enough to be as courteous to his most humble subordinates as he is to his employer. Such are the duties and attributes which belong to a foreman. How many have them must be determined by others than ourselves.—*The Carriage Monthly.*

Management of Pot Plants.

The best directions for potting plants we have ever seen published are found in the *Western Rural:*

Amateurs are apt, in repotting plants, to make the soil too rich, under the impression that, because the roots are confined within a small compass, necessarily the soil must be very fat. Such is not the fact. Flowering plants should not have the soil over rich. They do better in pure soil, free from an excessive quantity of manure. What is used should be the most thoroughly digested compost. The successful florist understands that the soil requires only to be in the normal state to insure perfect and continuous growth; and therefore, instead of making the soil in the pots over rich, he depends upon stimulating, when wanted, by means of liquid manure.

A mistake generally made in shifting from one pot to another is the use of too large pots as the plants increase in size. In changing, use pots only one size larger than the plant was in before. To do this in the best manner, put some drainage in the bottom of the pots, say half an inch of broken flower pots for four inch size, being careful to close the hole in the bottom by laying a piece thereon; on this place a little rich compost mixed with one half its bulk of sharp sand. Then place a pot one size less than the one containing the plant to be moved. Fill in around this with the same material pretty finely packed. Lift out the pot and fill with soil, just so that the ball of earth in which the plant is contained will reach to about half an inch of the rim of the new pot. Now set the plant in and cave the earth about it from the sides, and fill up level with more soil.

Chloral Hydrate in Neuralgia.

The intimate mixture of equal parts of chloral hydrate and camphor will, it is said, produce a clear fluid which is of the greatest value as a local application in neuralgia. Dr. Lenox Browne states, in one of the English medical journals, that he has employed it in his practice, and induced others to do so, and that in every case it has afforded great and in some instances instantaneous relief. Its success, he says, does not appear to be at all dependent on the nerve affected, it being efficacious in neuralgia of the sciatica as of the trigeminus; it is of the greatest service in neuralgia of the larynx, and in relieving spasmodic cough of a nervous or hysterical character. It is only necessary to paint the mixture lightly over the painful part, and allow it to dry. It never blisters, though it may occasion a tingling sensation of the skin. For headache it is also found an excellent application.

SCIENTIFIC AND PRACTICAL INFORMATION.

CONCRETE TO EXCLUDE RATS.

A correspondent of the *Building News* says: "Nothing can be better to exclude rats than to concrete the surface of the ground beneath wood floors; not only for this, but also to prevent the growth of vegetable matter, and to prevent, as well, damp rising. All ground floors, whether wood, paved, or tiled, should have a layer of concrete, 3 inches to 4 inches thick, between them and the soil. I have been in the habit of doing this for years, and all such houses have dry floors, and are vermin-proof, as far as the latter are concerned, as rats cannot disturb well made concrete. The concrete should be made of moderately fine gravel (broken flint or glass added to it is an improvement), mixed with Portland cement, in the proportion of 1 of cement to 7 of gravel. Not too much water should be used, but the cement must be thoroughly mixed with gravel, and, when deposited in place, well trodden or beaten with a grass beater. Three or four inches, at most, is sufficient in thickness."

A RAT PLAGUE.

Strange news comes from the Hill Districts of Burmah. The English authorities—commissioners and chaplains of Rangoon and others—have sent out a pitiful appeal for help. Ten thousand villagers are starving. It is not drought, as in Bengal, protracted cold and untimely rains, as in Asia Minor, nor grasshoppers, as in Kansas, that has brought so many people to dire necessity. It is rats. An area of six thousand square miles has been overrun with these "British vermin," which have spared nothing in their widespread devastation. The appeal declares that the people are entirely destitute; their accumulations have been exhausted, and they have no occupation but husbandry to depend on for daily food. With rats so numerous as to eat up everything, nothing short of aid from without can keep the people alive. As nothing is said about subsisting on the enemy, it is to be presumed that the up-country Burmese are, like the lately afflicted Bengali, confirmed vegetarians, and would sooner starve than eat flesh.

THE JAPANESE GOLD FIELDS.

We are indebted to Professor Henry S. Munroe of the Imperial College, in Tokio, Japan, for a recent report prepared by him upon the gold fields of the Island of Jesso. The results obtained give very little promise of the precious metal being mined to any great extent, since the highest average value, per cubic yard of the gravel examined in any one field, reaches but 3·77 cents. In the large majority of cases, this value is greatly lessened, being reduced to as low as some hundredths of a mill. The poorest gravel worked in California by the hydraulic process yields from five to ten cents per cubic yard, while the average is said to be from twenty-five to thirty-five cents. These are thick gravel deposits, and thin places, like the Toshibetsu field, which gives the high average above mentioned, are usually much richer. The upper valley portion of this Toshibetsu field, Professor Munroe thinks, might be profitably worked, as it yields 5·66 cents per cubic yard; but this view is again rendered questionable by the enumeration of obstacles in the shape of the dense vegetable overgrowth, and the inefficiency of the laborers.

NEW PLANETS.

During the month of June last, three new planets were discovered, two by Professor C. H. Peters, Nos. 144 and 145, respectively of the 11th and 12th magnitude, and one by M. Borelly, at Marseilles, No. 146, 11th magnitude.

THE JAMIN MAGNET.

There are no phenomena in physical science of which the cause is less understood than the phenomena of magnetism. That there are relations existing between the latter and the phenomena of electricity is well known; the one produces the other, and reciprocally. But as to what takes place within a magnetized body—what changes occur in its interior constitution at the instant when the magnetization begins or ends—no one has yet been able to adduce a certain and definite explanation. To the very lack of this last may be ascribed the slow progress which has been made in improving the construction of the magnets themselves. The nature of the steel, its degree of temper, the number and dimensions of the plates, their form, the area of the polar portions in contact with the armature, the dimensions of the armature itself, all are important elements to be taken into consideration; but the sum of our knowledge, as to the selections to be made under these divers conditions, results in an assemblage of empirical recipes rather than in a logical and connecting series of scientific rules.

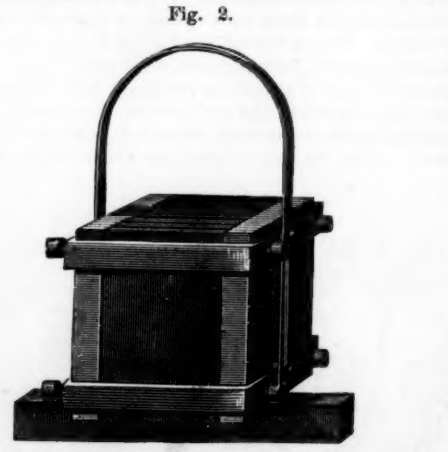
For some four years past we have had frequent occasion to allude to the discoveries and investigations of M. Jamin, a distinguished French physicist, who has succeeded in establishing a large number of important facts, thus realizing advances of great value in the construction of magnets. While it would be impossible, in the space here at our disposal, to review M. Jamin's work in detail, a few of his more salient discoveries may be profitably recalled. At the outset the investigator found himself obliged to invent a method of study. The ordinary way of determining the power of a magnet consisted in applying an armature and measuring the amount of weight which, attached thereto, the magnet would sustain. This plan, besides being crude, frequently involved error, since it may easily happen that one magnet, in reality better than another, will yield to a less weight, while a very slight modification of the polar faces often results in very great differences in the total weight which a magnet is capable of supporting. M. Jamin's device for overcoming these difficulties consists simply of a nail suspended by a string from the arm of a balance. The nail, presented at various points of a magnetized bar or at corresponding points of several bars, is attracted, and the degree of attraction is noted by the balance, so that it is obviously easy thus to measure the magnetism of different localities, and to compare several magnetized plates with each other. If several magnetized bars are superposed, it has been found that the attraction (measured at the extremity of the assemblage by means of the nail) augments with the number of bars, and then becomes stationary. To illustrate, one bar or plate attracts the nail with a certain force, say 750 grains; two plates, superposed, exercise a force of 875 grains; three, 1,425 grains; four, 1,575; and five, either the same as four, or perhaps 15 grains more. The fifth plate, therefore, adds nothing, or nearly nothing, although it has been magnetized in the same manner as the others, and when tested singly is as powerful as any one of them. This, however, is not all; if the plates be separated and re-examined, it is found that they are less powerful than before, and that their union has resulted in loss. They have, in other words, acted upon each other unfavorably.

While the facts contained in the foregoing paragraph are not novel, having already been pointed out by Coulomb, it has been reserved for M. Jamin to discover that they are not exceptional or fortuitous, but absolutely constant and regular, and also to find a means of preventing this tendency of the superposed plates toward mutual deterioration. This means is simply the attaching, to the ends of the bundle of plates, of pieces of soft iron which partake of the magnetism of the extremities. If, under these new conditions, the experiment above described be repeated, the fifth plate is found to add as much as its predecessors, and the number of plates may be largely augmented before the effects, which in the former case are noticeable manifest themselves. Finally, with a certain number of plates, 20 for example, the soft iron pieces become saturated with magnetism, and further additions are of no value or are mutually injurious. If, instead of employing bars, thin ribbons of steel be used, superposed as above explained, the magnet invented by M. Jamin, and represented in Fig. 1, is obtained. The plates are curved, and the poles, brought near together, are separated by a piece of brass to which they are firmly screwed. The various advantages gained by this form, apart from those mentioned above, we have already discussed in detail in back issues of this journal. Perhaps the most important is the facility with which the magnet may be taken apart and put together, or with which the number of plates, and consequently the degree of magnetism, may be varied.

Fig. 1.

The latest form of magnet devised by M. Jamin is represented in Fig. 2 (which, with the former illustration, we extract from *La Nature*). The poles are of soft iron and are applied to the extremities of several steel leaves, which are made broad in proportion to their length. Singly the plates support but very small weights; but when combined with the iron end pieces, the latter absorb the magnetism, rendering the assemblage sufficiently powerful to carry twice or three times its own weight.

Fig. 2.



A very remarkable peculiarity of this magnet, which is not clearly explained, is that neither pole, when tested separately, has any very marked attractive force; but when the armature is applied simultaneously to both poles, it is very strongly held, and yet the attraction does not seem to act over any appreciable distance. It appears, in fact, that the magnetic current must be completed before the maximum force is developed.

Co-Operation in Building.

Hon. Josiah Quincy, in a letter printed in the Boston *Advertiser*, says: A number of Germans who were accustomed in their own country to a system of coöperation, purchased a tract of land in Dedham. Ten of them erected houses for their own use. A separate mortgage for about $2,000 was taken on each house to secure a joint and several bond signed by the ten owners, by which they agreed to pay $6 a week into a savings bank to the credit of the mortgagee and trustee. One half of each deposit is enough to pay the interest semi-annually at seven per cent, and the other half goes on on interest, with a certainty that in a few years it will pay the principal and leave the houses unincumbered. On the first days of January and July, the mortgagers have sent their deposit books to the trustee and mortgagee, who has drawn the semi-annual interest and returned the books with their accumulations to the owners, every payment increasing his security, and the association taking only the risk that every holder of real estate takes who leases his property. Ten or more industrious and temperate men, who had confidence in one another, might form such an association with peculiar advantages. They might choose their locality either together or separately, giving an excellent security that they would pay their interest semi-annually, and the principal in a fixed time.

The Secrets of Philadelphia Butter.

Every one has doubtless heard of the celebrated Philadelphia butter, the delicious flavor of which renders it a delicacy which, in markets outside of its place of manufacture, brings prices which sometimes range as high as a dollar a pound. How it is made is told in a new and excellent little work, recently written by Mr. X. A. Willard, editor of the dairy department of Moore's *Rural New Yorker*, and entitled "Willard's Practical Butter Book." A notice of the volume will be found elsewhere. On the subject of Philadelphia butter, we take from its pages the following:

The celebrated Philadelphia butter comes mainly from Chester, Lancaster, and Delaware counties, Pennsylvania. The spring house is about 18 feet by 24 feet, built of stone, with its foundation set deeply in the hillside, the floor being about four feet below the level of the ground at the downhill side. The floor is of oak, laid on sand or gravel; this is flowed with spring water to the depth of three inches, and at this hight the flowing water passes out into a tank at the lower side of the spring house. The milk, when drawn from the cow, is strained into deep pans which are set in the water upon the oaken floor. Raised platforms or walks are provided in the room for convenience in handling the milk. The walls of the spring house are about ten feet high, and at the top on each side are windows covered with wire cloth for ventilation. The depth of the milk in the pans is about three inches, and the flowing water which surrounds the pans maintains a temperature of about 58° Fah.

The milk is skimmed after standing 24 hours, and the cream is put into deep vessels having a capacity of about 12 gallons. It is kept at a temperature of 58 degrees to 59 degrees, until it acquires a slightly acid taste, when it goes to the churn. The churn is a barrel revolving on a journal in each head, and driven by horse power. The churning occupies about an hour; and after the buttermilk is drawn off, cold water is added, and a few turns given the churn, and the water then drawn off. This is repeated until the water as it is drawn is nearly free from milkiness. The butter is worked with butter workers, a dampened cloth meanwhile being pressed upon it to absorb the moisture and free it of buttermilk. The cloth is frequently dipped in cold water and wrung dry during the process of "wiping the butter." It is next salted at the rate of an ounce of salt to three pounds of butter, thoroughly and evenly incorporated by means of the butter worker. It is then removed to a table, where it is weighed out and put into pound prints. After this it goes into large tin trays, and is set in the water to harden, remaining until next morning, when it is wrapped in damp cloths and placed upon shelves, one above another, in the tin-lined cedar tubs, with ice in the compartments at the ends, and then goes immediately to market. Matting is drawn over the tub, and it is surrounded again by oilcloth so as to keep out the hot air and dust, and the butter arrives in prime condition, commanding from seventy-five cents to one dollar per pound

Mr. Isaac A. Calvert, who markets his butter at those high prices at Philadelphia, attributes his success to three points: —1. The food of his cows. 2. Temperature. 3. Neatness and dainty refinement at every step, from the moment the milk flows from the udder till the dollar in currency is paid for the pound of butter. He says: "I have found that I make my best butter when I feed on white clover and early mown meadow hay. I cut fine, moisten, and mix in both corn meal and wheaten shorts. Next to meal I regard shorts, and prefer to mix them together. I feed often, and not much at a time. I do not use roots, unless it be carrots. My pastures and meadows are quite free from weeds. I cannot make this grade of butter from *foul pastures* or low grade hay.

"*Temperature.*—This I regard as a matter of prime importance in making butter that commands a high price. Summer and winter I do not permit my milk room to vary much from 58°. In summer I secure the requisite coolness by spring water of the temperature of 55° Fah., flowing over stone or gravel floor in the milk house. This can be accomplished without water in a shaded cellar ten feet deep. As good butter can be made without water as with but the milk and cream must be kept at all times a little below 60°.

"We skim very clean, stir the cream pot whenever a skimming is poured in, and churn but once a week, summer and winter. Just before the butter gathers, we throw into the churn a bucket of ice cold water. This hardens the butter in small particles and makes a finer grain. In the hot months this practice is unvarying.

"In working, we get out all the buttermilk, but do not apply the hand. A better way is to absorb the drops with a linen cloth wrung from cold water. The first working takes out all the milk; at the second we handle delicately, with

fingers as cool as may be. The salt is less than an ounce to a pound; but not generally much less. The balls each weigh one pound, and receive a uniform stamp. On packing for market, each ball is wrapped in a linen cloth, with the name and stall of the marketman written upon it. Our tubs are made of cedar plank, 1½ to 2 inches thick, and lined with tin. On the inner face are projections, on which the shelves rest. The balls are not bruised or pressed at all, and pass into the hands of the customers as firm, as perfect in outline, and as spotless as when they left the spring house.

"We find uniformity to be a prime virtue in the butter-maker. We produce the same article whether the cows stand knee-deep in white clover blooms, or sun themselves on the lee side of the barn in February.

"There is a small ice chamber at the end of the oblong butter tub which we use in summer, so that in dogdays the heat within the tub does not get higher than 60° Fahrenheit. I need not add that we observe a scrupulous, a religious neatness in every act and in every utensil of the dairy. Milk which, upon leaving the udder, passes through an atmosphere loaded with stable fumes will never make butter for which we can get a dollar per pound. No milk sours upon the floor of the milk room; none is permitted to decompose in the crevices of the milk pans; the churn is scoured and scalded till no smell can be detected but the smell of white cedar.

"Our customers take the napkins with the prints, wash, iron, and return them when they come to the stand on market day. These are generally Wednesdays and Saturdays. With these prices we have no difficulty in making a cow pay for herself twice a year; if she cost $60, we sell $120 worth of butter from her in twelve months."

It may be remarked that the sour milk is employed by the Philadelphia butter makers as food for swine. It is estimated that such milk will make 100 pounds of pork per cow.

The cows in the district where the Philadelphia butter is made are well sprinkled with the Jersey or Alderney blood, and about a pound per day from each cow is considered a fair average for the best dairies.

The University Athletic Contests.

The annual regatta of the American Universities took place on Saratoga Lake, N. Y., on the 15th of July. An immense concourse of spectators was present. The distance, three miles, was accomplished by the respective crews in the following time and order:

Place.	Time. M.	S.
1. Cornell	16	53¼
2. Columbia	17	04¼
3. Harvard	17	05¾
4. Dartmouth	17	10¾
5. Wesleyan	17	13¾
6. Yale	17	14¾
7. Amherst	17	29¾
8. Brown	17	33¾
9. Williams	17	49¾
10. Bowdoin	17	50¾
11. Hamilton	Not taken	
12. Union	Not taken	
13. Princeton	Not taken	

The victory of the Cornell crew gave great satisfaction to all except the losers.

During the foot races, which took place on July 16, some remarkably rapid walking and running was accomplished. The first trial was a one mile run, in which Messrs. Copeland, of Cornell, Barber, of Amherst, Fort, of Wesleyan, and Shute, of Williams, took part. The Amherst representative won the race in 4m. 44⅘s., coming in about a yard ahead of the Cornell man. The others withdrew during the contest.

Cornell, Williams, Wesleyan, Princeton, and Harvard contested the one mile walk. Mr. Platt, of Williams, won in 7m. 50s. Times of others not given.

The quarter mile run was won by Mr. Culver, of Union, who reached the goal in 55½ seconds, closely followed by Yale and Cornell. The severest contest was the seven mile walk. The record is as follows: Mr. Taylor, of Harvard, won in 65m. 5⅘s., Mr. Driscoll, of Williams, second—fainted at end; Mr. Boyd, of Columbia, third. The Dartmouth and Wesleyan representatives broke down and withdrew. The half mile run was gained by Mr. Trumbull, of Yale, in 2m. 6⅘s., against one competitor (Amherst), who came in 50 feet behind. The three mile walk was easily won by Mr. Taylor, of Harvard, in 25m. 28s. Mr. Platt, of Williams, came in second, in 26m. 16⅘s.; the third competitor (Brown) broke down. Mr. Culver, of Union, won the 100 yard dash in 10⅘s., Williams second, and Yale third. An exciting three mile run was won by Mr. Morell, of Amherst, in 14m. 17s., the Wesleyan and Columbia competitors withdrawing before the finish. Mr. Maxwell, of Yale, won the hurdle race against three others; no time given. The graduates' seven mile run was gained by Mr. Eustis, of Wesleyan, over Mr. Gunster, of Williams, by ten feet; time 69m. 49⅘s. Suitable prizes were awarded to the various winners by ex-Governor Hoffman.

Cultivate Good Manners.

It is one of the laws of our being that every inward disposition is strengthened by the outward expression which represents it. Besides this, so much of human happiness is dependent upon the manners that no truly benevolent person, if thoughtful, can disregard them. We have all experienced the charm of gentle and courteous conduct; we have all been drawn irresistibly to those who are obliging, affable, and sympathetic in their demeanor. The friendly grasp, the warm welcome, the cheery tone, the encouraging word, the respectful manner, bear no small share in creating the joy of life; while the austere tone, the stern rebuke, the sharp and acrid remark, the cold and indifferent manner, the curt and disrespectful air, the supercilious and scornful bearing, are responsible for more of human distress, despair, and woe than their transient nature might seem to warrant.

Whether we aim at self-improvement or the well-being of others, success is largely dependent on our outward demeanor. No one can slight it with impunity. It has many counterfeits and shams which are truly despicable; but where pure motives are supreme, and the aims of life are worthy, the culture of manners is an essential means of progress, conferring dignity and grace upon every noble endeavor.—*Philadelphia Ledger.*

AT the recent Bunker Hill Celebration in Boston, the National Tube Works Company was represented by some fine specimens of lap-welded wrought iron tubing, drawn by six large black horses on a wagon tastefully draped with bunting. The tubing, some of the specimens of which were very large, was effectively arranged to represent a cannon on a gun carriage. The carriage was made of tubing, six sections on a side, the cannon being represented by a section of lap-welded tubing twelve inches in diameter, said to be the largest manufactured in the world. On each of the tubes of which the carriage is composed is the name of one of the original thirteen States, and on the large tube representing the big gun was inscribed:

"Massachusetts, 1775—Our Union Welded—1875."

To remove fruit stains from napkins, etc., wet the spots with chlorine water.

DECISIONS OF THE COURTS.

United States Circuit Court---District of Massachusetts.

DAVID M. WESTON *et al.* *vs.* NATHANIEL C. NASH *et al.*—PATENT SUGAR MACHINE.

[In equity.—Before SHEPLEY, J.—Decided April, 1875.

The fifth claim of reissued patent of David M. Weston for "Improvement in Centrifugal Machines for Draining Sugar, etc.," dated January 14, 1868, (original dated April 9, 1867), namely, "the construction of the openings, I, in the bottom of the cylinder in such machines, and the valve, J, for the purpose of closing the same, substantially as described"—is not limited to such centrifugal machines only as are constructed in all respects like those described in these specifications.

The term "such machines" in this claim means such centrifugal machines as are so constructed as to admit of the application and operation of the claimed devices in substantially the described mode and by substantially the described means.

The unauthorized use of complainants' openings and valves would be an infringement if used in centrifugal machines, to which they could be usefully applied by reason of there being an unobstructed space at the bottom of the machine, into which the sugar could fall, although the cylinders were not suspended as shown in the patent.

The Weston invention is not anticipated by the device shown in the British patent of Hardman, of 1843, in which the openings in the bottom plate of the rotary cylinder are closed by a disk or plate held up against them while the machine is in operation by a nut and spring, and simply lowered, without being removed, so as to leave a free and unobstructed space, when the sugar is to be discharged.

Nor by the Alliott machine, described in English patent of February 3, 1851, in which the bearings of the shaft and its foundations are directly under the cylinder, so as to render impossible a free and unobstructed space below the cylinder into which the sugar may be discharged.

Although the defendants' valve is operated by turning on the shaft, and, in this respect, may be an improvement upon the valve of the patent, which moves up and down on the shaft, this is not a substantial difference. It is but another form of the same device, with the same mode of operation, so far as the operation is concerned to which the whole device relates—that of discharging through the bottom of the cylinder the purged contents of the charge.

[*George L. Roberts*, for complainants.
James B. Robb, for defendants.]

United States Circuit Court---Southern District of New York.

WILLIAM WICKE *vs.* HENRY AND BARBARA KLEINKNECHT.

[In equity.—Before BLATCHFORD, J.—December, 1874.]

Where a machine was licensed for use in a particular territory: *Held*, that the use of it, by subsequent purchasers, in territory other than that for which it was licensed, was unlawful.

The mere fact that the agent of the patentee, after the transfer of the machine to the unlicensed territory, demanded of the purchasers the back royalties due upon it, conferred no right to use it outside the territory named in the license.

[This was an action brought by the complainant, as assignee of certain territory under the patent of George Wicke, granted to the latter June 16, 1863, for a box-nailing machine. The facts were as follows: The complainant, by assignment, acquired the exclusive right under said patent for the State of New York. The remaining territory was owned by the original patentee, but the complainant was his attorney authorized to collect royalties and grant licenses for said territory. Under this power of attorney he licensed one Oppel to use one of the patented machines in Newark, N. J. Oppel sold this machine to the defendants, who took the same to New York, and there used it. Suit was brought, and defendants pleaded an implied license, which they claim they derived from the complainant through his demand on them for payment of certain royalties due from Oppel at the time he sold the machine.]

BLATCHFORD, J.:

The evidence in this case leaves no doubt that the plaintiff is entitled to a decree. By the purchase by one of the defendants from Oppel of the machine in question, and by the transfer from Oppel to such defendants of the rights of Oppel under the written license given by George Wicke to Oppel, neither of the defendants acquired any right to use such machine in the territory belonging to the plaintiff under the patent.

The plaintiff was the agent of George Wicke in respect to the license to Oppel, and he never demanded any license fee from either of the defendants, in respect of any other use of the machine than a use of it under and in accordance with the terms of the license to Oppel, which did not embrace a use of it in territory owned by the plaintiff.

Oppel had no right to use the machine in the plaintiff's territory, and could convey none. The plaintiff has given no license, direct or indirect, express or implied, to either of the defendants to use the machine in his territory.

[*A. V. Briesen*, for complainant.
J. Van Santvoord and *F. Forbes*, for defendants.]

NEW BOOKS AND PUBLICATIONS.

WILLARD'S PRACTICAL BUTTER BOOK—a Complete Treatise on Butter Making. By X. A. Willard, M. A. Illustrated. Price $1.00. New York city: Rural Publishing Company.

Mr. Willard has long been known to dairymen and agriculturists as President of the New York State Dairymen's Association, as editor of the dairy department of Moore's *Rural New Yorker*, and in general as a practical butter maker of considerable experience. Hence in the work before us—which we believe is the first ever published devoted wholly to the subject of butter and its manufacture—the advice, practical hints, and suggestions and discussions given emanate from one certainly conversant with his subject in all its branches. The book is, in fact, a complete repertory of information for farmers and dairymen, as it treats of everything relating to butter, from the selection, management, and raising of the stock, to the planning of dairies and the merits of the various patented inventions which have been made to facilitate dairy processes. Its low price places it within the reach of every farmer.

HOW TO TEACH CHEMISTRY: Hints to Science Teachers and Students, being the Substance of Six Lectures, delivered at the Royal College of Chemistry, in June, 1872. By Edward Frankland, D.C.L., F.R.S., Professor of Chemistry in the Royal School of Mines. Price $1.25. Philadelphia, Pa.: Lindsay and Blakiston, 25 South 6th street.

The teachers of physical science are largely indebted to Dr. Frankland for this book, which is an admirable and concise treatise on all the methods of exemplifying the action of the chemical forces. It commences with the very simplest experiments, and does not quit its subject until the most elaborate apparatus and its manipulation are fully described. By careful study of this little volume, lecturers and teachers can learn the whole art of illustrating their discourses.

ELECTRICITY, ITS THEORY, SOURCES, AND APPLICATIONS. By John T. Sprague, Member of the Society of Telegraphic Engineers. New York city: E. & F. N. Spon, 446 Broome street.

Mr. Sprague is well known as a writer of authoritative papers on electrical subjects, and many articles from his pen have been printed in our columns. In collecting the most elaborate of these papers into a volume, he has given us a text book of the greatest value, a manual complete, exhaustive, and practical. The chapter on electrolysis is worthy of special commendation and the section devoted to electro-metallurgy is a complete compendium of the art. The book is handsomely illustrated.

THE CONE AND ITS SECTIONS TREATED GEOMETRICALLY. By S. A. Renshaw, of Nottingham, England. Price 12s. 6d. ($3, gold). London: Hamilton, Adams, & Co., Paternoster Row.

This is an admirable treatise on the properties of the cone and the great importance of those properties to the art of mensuration. The primary properties of the sections are derived from the cone itself, the author following the example of Hamilton in reverting to the method of Apollonius of Perga, whose treatise on conic sections laid the foundation of the science, and whose system has not been superseded by the thousands of books which have since been written on the subject. Mr. Renshaw has reduced all his theories and problems into propositions of the most orthodox form, and has naturally succeeded in imparting comprehensibility and logical demonstration to a complex subject. He has produced a very interesting volume, and enriched it with illustrations of great value.

POPULAR RESORTS, AND HOW TO REACH THEM, combining a Brief Description of the Principal Summer Retreats in the United States and the Routes of Travel Leading to Them. By John B. Bachelder. Author of "The Illustrated Tourist's Guide," etc. Illustrated with One Hundred and Fifty-Two Engravings. Price $2.00. Boston, Mass.: John B. Bachelder, 41 Franklin street.

The desire to travel is universal; and the favorite recreation of all classes, be their leisure hours few or many, is found either in visiting the haunts of men, to observe the changes in social life and manners, or in fleeing from cities to view the works of Nature. Mr. John B. Bachelder, whose numerous works on the topography of the battlefield of Gettysburgh are widely known, has collected, in the volume now before us, a vast amount of information on nearly all the pleasure grounds of the United States, and has placed it before his readers in a most attractive and readable form. The illustrations are especially commendable, and the work is sure to have a large sale at the present time, to which its intrinsic merits fully entitle it.

HANDBOOK OF LAND AND MARINE ENGINES, including the Modeling, Construction, Running, and Management of Land and Marine Engines and Boilers. With Illustrations. By Stephen Roper, Engineer, Author of "A Catechism of High Pressure or Non-Condensing Engines," etc. Philadelphia, Pa.: Claxton, Remsen, and Haffelfinger, 624 to 628 Market street.

Mr. Roper needs no introduction to our readers as a competent and trustworthy authority on steam engineering; and the present volume will prove useful to all operatives who desire a treatise combining scientific accuracy with a popular style, free from formulas and ultra-mathematical expressions. The tables with which the book is interspersed are numerous and valuable; and there is at the end an interesting historical account of the steam engine.

PRACTICAL GUIDE TO THE DETERMINATION OF MINERALS BY THE BLOWPIPE. By C. W. C. Fuchs, Professor in the University of Heidelberg. Translated by T. W. Danby, M.A., F.G.S., Associate of the Royal School of Mines. Price $2.50. Philadelphia, Pa.: Claxton, Remsen, and Haffelfinger, 624 to 628 Market street. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This treatise is adapted to the use of any one who desires to easily recognize and comprehend the qualities of any mineral, provided he has an initial acquaintance with chemical manipulation. Although the work is fully descriptive, it is compendious, and will be found well adapted to use in the field.

INSECTS OF THE FIELD. By A. S. Packard, Jr., Editor of "The American Naturalist." Price 25 cents. Boston, Mass.: Estes and Lauriat, 143 Washington street. New York city: Dodd and Mead.

A very interesting little treatise, adapted for students' and amateurs perusal. It forms part 7 of the publishers' excellent series of "Half Hour Recreations in Natural History."

GREATER CHICAGO, Illustrating the Buildings Recently Erected in the Reconstructed City. Price $1.00. Chicago, Ill.: J. M. Wing & Co., Ashland Block.

This pamphlet consists entirely of illustrations, which are intended to convince the world that Chicago's commerce is on a scale commensurate with her indomitable energy and the public spirit of her citizens. Many of the buildings represented are of considerable architectural merit.

A BRIGHT MOON, SUN, AND STAR SHINING POCKET MIRROR OF THE UNIVERSE. By D. L. Stinchfield, New Richmond, Ohio.

"Our spiritual kingdom of Heaven is three times divided," says our author, "vertically into the three seats, or two antagonistic, positive and negative extremes, and their saving mediator with positive electricity found at the bottom of this great spiritual and pacific and specific ocean of the atmosphere." There is some deep significance in this; and as we feel bound to confess our inability to extract it, we cheerfully resign the task.

STATEMENT OF REASONS FOR EMBRACING THE DOCTRINES AND DISCLOSURES OF EMANUEL SWEDENBORG. By the Rev. George Bush. New York city: E. H. Swinney, 20 Cooper Union.

GRANULATION OF GUNPOWDER. By Commander J. D. Marvin, U. S. N. Naval Experimental Battery, Annapolis, Md.

THIRD ANNUAL REPORT OF THE BOARD OF MANAGERS OF THE ZOOLOGICAL SOCIETY OF PHILADELPHIA, PA.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From May 18 to June 3, 1875, inclusive.

AMALGAMATOR.—S. F. Clouser, New York city.
BLANKS FOR SHOVELS.—E. Binns *et al.*, Pittsburgh, Pa.
BOILER BATTERY.—G. Crompton, Worcester, Mass.
BOTTLE STOPPER, ETC.—N. Thompson (of Brooklyn, N. Y.), London, Eng
CARDING MACHINE, ETC.—G. S. Harwood, Boston, Mass.
COMBINATION FURNITURE, ETC.—A. E. Barnes, New York city.
ELECTRIC ENGINE.—C. A. Hussey, New York city.
ELECTRIC MOTOR.—H. M. Paine *et al.*, N. J.
FLOODING TO PREVENT FIRE.—J. H. Morrell, New York city.
FURNACE BAR.—C. Todd, New York city.
GAS ENGINE.—D. V. Bruce *et al*, San Francisco, Cal.
GAS STOVE.—J. J. West, Chicago, Ill.
HOIST.—W. D. Andrews, Brookhaven, N. Y.
LAMP, ETC.—H. G. Moehring, Philadelphia, Pa.
LATHE.—A. Wood, Worcester, Mass.
LIQUID METER.—H. S. Maxim, Brooklyn, N. Y.
MAKING ALKALIES, ETC.—J. Bennett, Mich.
REGULATING CLOCKS, ETC.—L. Eaton, Worcester, Mass.
SAIL HANK.—D. G. Low, Chelsea, Mass.
SCREWING PIPES, ETC.—F. W. Allin, New York city.
SEWING MACHINE.—J. J. Thompson, New York city.
SHOVEL, ETC.—T. J. Blake, Pittsburgh, Pa.
SMELTING IRON, ETC.—W. Rogers, Leechburg, Pa.
SPARK ARRESTER, ETC.—T. Shaw, Philadelphia, Pa.
STEAM ENGINE.—F. Alden *et al.*, Pittsburgh, Pa.
STEAM PUMP.—C. H. Hall, New York city.
TINNED PLATE.—G. E. Taylor, Philadelphia, Pa.
TOY MENAGERIE.—C. M. Crandall, Montrose, Pa.
TREATING WASTE GASES, ETC.—J. Turner, Chicago, Ill.
WATER METER.—P. Ball *et al.*, Worcester, Mass.
WHEEL AND AXLE.—R. W. Davis, Flushing, N. Y. *et al*

Recent American and Foreign Patents.

Improved Non-Interfering Fire Alarm Telegraph.

Joseph W. Kates, Richmond, Va.—The object of this invention is to provide an improved electric fire alarm, in which is avoided the interference and confusion of signals caused by the sending of two separate signals from different points at the same time. It consists in a method of connecting the instruments at the different signal stations by a second electric circuit, which circuit is opened or closed automatically to operate the armature of an electromagnet, which serves as a stop for a clock mechanism, and locks, by means of the said second circuit, all of the instruments at the signal stations except the one in operation, for the prevention of all interference between the different instruments. It also consists in the method of automatically operating the armature, having a stop for the clock gearing for the locking or unlocking of the other instruments, by a non-conducting tape placed upon the same drums with the signal tape, and passing between contact rollers that form the electrodes of the second circuit, and perforated at its extremities, so that the second circuit is closed for this particular instrument whenever the tape is entirely wound up or entirely run down, and is opened during the operation of the instrument to lock the other instruments. The invention further consists in the combination with the main drum or spring shaft carrying a pinion of a rack bar that engages with a shoulder upon the stop of the armature, to prevent the operating instrument from locking itself.

Improved Water Wheel.

Stephen R. Jenner, Milltown, Ind.—The object of this invention is to utilize a larger per cent of motive power than is usually obtained in common turbine wheels. It consists in placing stationary water ways in between two or more turbine wheels attached to the same shaft, the said water ways being detached from the shaft, alternating with the turbine wheels, and running in direction transversely to the spiral flanges of the turbine buckets. It also consists in the combination with the said wheels and water ways of a cylindrical cut-off and a counterbalance to render the said cut-off sensitive to the action of a governor.

Improved Wire Fence Tightener.

Warren L. Brown and Joel B. Cramer, Dunlap, Iowa.—The object of the invention is to provide, for farmers and others having occasion to construct wire fences, a compact, portable, and efficient device for tightening or straining the wires of such fences, the same being adapted for convenient attachment to and detachment from a post. The wire is attached to a pronged bar, which is adapted to slide on another bar secured to a post. The sliding bar is adjusted by a nut, and the wire is clamped by jaws attached to the stationary bar.

Machine for Handling Straight-Cut Tobacco.

Francis S. Kinney, New York city.—This is a machine for removing straight-cut tobacco from the cutting machine, and boxing or bunching it, without allowing its fibers to become disordered or entangled, and enabling it to be boxed or bunched with the straightest fibers upward.

Improved Grate.

Charles C. Gates, Albany, N. Y., assignor to J. L. Mott Iron Works, New York city.—This consists of a grate, in combination with an outer vibrating ring, the ring being corrugated on its upper surface, which is in the plane of the grate. The concave parts of the corrugations incline downward radially to the periphery, to facilitate the throwing off of the refuse when shaken. The ring is rigidly attached at the lower side to arms, intersecting at the grate's center with a center pin, on which the ring oscillates to shake the grate. The pin is pivoted in a center bearing, rigidly supported by arms of the base of the stove. The invention also consists of a dumping hook for the grate, attached to the center of the ring, in which a journal of the grate rests. The bearing is forward of the grate's center on the depressing side, to lessen the dip of the grate in the ash pit when dumping, and thus affording more freedom for removing the ash pan.

Improved Stud Fastening.

John C. W. Jefferys, Tottenham Court Road, London, Eng.—This invention relates to articles of jewelry or fastenings for dress; and consists in the combination of a flat oblong shank, with the well known crescent shaped-back, capable of being inserted in the button hole by a rotary movement. The back is so constructed as to be turned in either direction, the shank being either flat or consisting of two or more pillars.

Improved Tram Staff.

Samuel B. Williams, Bridgeport, Ohio, assignor of one half his right to Seymour C. W. Dunlevy, of same place.—A tram staff about equal in length to the diameter of the mill burrs is adjustably attached by rectangular brackets to the ends of arms of an upright standard. Sleeve-shaped projections at the central part of standard fit on a center shaft that is provided with a tripod-shaped part to be applied to the spindle of the bed stone. The center shaft is set into a perfectly vertical position to the face of the burrs by revolving the staff at some distance above the same, and adjusting a crank screw at the top of the standard until a regulating quill or piece of steel at the outer end of the staff forms an even contact at the circumference of the burr. In this manner the center shaft may be set by the adjusting screws more readily into vertical position on the burrs.

Improved Washing Machine.

Charles E. Ross, Lincoln, Ill.—By tightening up the nuts of bolts, the staves or strips will be drawn closer together to take up any shrinkage of the wood, and thus keep the suds box always tight. Curved cleats of the suds box and curved cleats of the rubber are placed in reversed positions with respect to each other, the result of which construction and arrangement is that the clothes will not be rolled up in the middle part of the bottom of the suds box.

Improved Hay Press.

William Henry Penniston, Fox, Mo.—By this construction, when the doors of the baling box are unfastened to remove the bale, the same operation releases the lower part of the box, so that the bale, being released from both side and end pressure, may be easily removed.

Improved Cracker Machine.

Adam Exton and John Exton, Trenton, N. J.—This invention relates to an improved cracker-molding machine. The basis of the claims is the mechanism whereby the crackers are conveyed or fed to the docker, and cleared from the table upon which the molding process is completed.

Improved Portable Fence.

Joseph L. Welshans, Mo.—This is a portable fence panel, composed of rails pivoted in posts and secured in a central clamp, which is tied near top and bottom. Braces are arranged to support the rails and uprights.

Improved Calendar.

L. L. Kellogg, Leon, N. Y.—The invention relates to modes of exhibiting on clocks the day of the week, the month, and the day of the month; and consists in combining a loose lift bar having end hooks and notches with an hour hand shaft and lever, as well as an intermittent pin wheel with a fixed disk, an adjustable disk, and a stationary hand.

Improved Car Starter.

George Hunter, Payson, Ill.—To the inner side of one of the wheels is rigidly attached a small gear wheel, and to the inner side of the other wheel is attached a large internally toothed gear wheel. A shaft placed parallel with the axle is made in three parts, connected with each other by universal joints. To the middle part of the shaft is attached one end of the spring, which is coiled around the said shaft. The end parts of the jointed shaft engage by gears with the gear wheels above mentioned. Devices are provided which lock the levers, which hold the gear wheels in gear and out of gear. When the car is to be stopped, the apparatus is so regulated that the forward movement or momentum of the car may wind up a spring. When the car is to be started, the power of the spring may be applied to the wheel near its rim, and thus, with a great advantage of leverage, assist in starting the car. In the same way the spring may be coiled by the advance of the car when upon a level or down grade, and held, to be applied to the car when upon a short upward grade, to assist in its propulsion.

Improved Weed-Covering Attachment.

Joseph W. Dysard, Michigan City, Ind.—A wheel, which runs in the furrow last plowed, is pivoted to the end of an adjustable bar, which is curved to correspond with the position of the furrow slice as it is being turned by the mold board. By this construction the bar, as the plow is drawn forward, will bend down the grass, weeds, and stubble that may be upon the furrow slice longitudinally with the furrow, so that they may be wholly covered.

Improved Peg Cutter.

Matthew Buhler, Lamoille, Ill.—This is an adjustable cutter and rasp, by which the pegs may be removed from any part of the bottom of a boot or shoe. The face of the wheel is rigidly attached to the stem. There are two mortises for the stem, which unite at the end of the shank, and branch obliquely therefrom through opposite sides of the latter. By turning over the shank, the position of the cutter and rasp is changed to enable the operator to cut the pegs from any part of the bottom. Cutters are arranged at both ends of the tool. The rasp follows the forward cutter. An aperture at the heel of the tool has a sharp edge for smoothing off the pegs in the heel of the boot.

Improved Car Brake.

John E. Worthman, Mobile, Ala.—This invention relates to certain improvements in car brakes; and it consists in the combination with a worm or screw thread upon the car wheel shaft, of an adjustable pin attached to a lever arm provided with right angular arms which are connected with the traction rod through which the brakes are applied. The said pin is adjusted so as to be raised above the worm upon the shaft, or depressed so as to register therewith and move the lever arm, in which it is contained, laterally, for the purpose of applying the brakes through the right angular arms as elbow levers. It also consists in the devices for operating the adjustable pin, consisting of a rock shaft which has an arm that is attached to a sliding collar that raises the lever carrying the pin, and a second arm that is attached to an indented disk, so combined with a ratchet wheel and pawl as to apply or remove the pin by the same movement.

Improved Check Valve.

H. P. Buffon, Cleveland, Ill.—The invention consists in combining, with a hollow plug valve, a check valve having its seat in a partition of valve case.

Improved Earth Auger.

John T. Kemper, Hannibal, Mo.—This consists of a cast iron auger pot or body with open sides, having outer reaming plates, and detachable cap sections that close the sides, and are attached to top by a set screw.

Improved Car Coupling.

George W. Kyle, Mylo, Ohio.—The coupling pin is suspended to the front arm of an angular frame that slides in suitable guides of the wall of the car. A lateral piece is supported on the front arm of the frame, and is provided with guide slots for vertical rods, which are pivoted at their upper ends and at their lower ends below the drawhead to a lateral rod that is attached to the longitudinal swinging arm of a flat guide spout. An arm carries the spout up into inclined position along the lower part of the drawhead on raising the pin-supporting frame. The spout serves then for taking up the coupling link of the approaching car, and for conveying it into the cavity of the drawhead simultaneously with the concussion and the carrying back of the slide piece. The pin and pin frame drop thereby, and carry the spout to some distance below the drawhead suspended on the spring rods, but out of the way of damage by the concussion of the drawheads. The pin couples in dropping the link.

Improved Faucet.

Robert L. Hallett, Brooklyn, N. Y.—This is an improved faucet for drawing hot and cold water, or two kinds of liquids, either at the same time and mixed or separately, and discharging them through the same discharge pipe. The invention consists in the combination, with a spherical case having two inlets and a single outlet, of a spherical valve contained within said case, and operated by a stem connected with a hand wheel. The said valve has an orifice which is narrow in the middle and broad at the outer edge, so that the two inlets of the case may be opened either singly or both at a time.

Improved Regulator for Hemp-Spinning Machines.

Christopher Herschaft, Brooklyn, N.Y.—In this invention a countershaft, having two driving pulleys of different sizes, is belted to the driver for the gill bars, and the main driver belt is contrived to be automatically shifted by the upper condensing roller from one to the other of the pulleys on the countershaft for turning the aforesaid pulleys. The arrangement is such that, when the sliver is too large, the rising of the condensing roller will shift the belt on to the pulley for slow speed to feed slower, or on to the loose pulley to stop the gill chain in case the sliver is very much too large. When the sliver is too small, the belt will be shifted so as to increase the speed of the gill bars and feed faster.

Improved Horse Power Link.

Barnard L. Olds, Highgate, Vt.—Many portable horse powers for thrashing grain and other purposes consist of an endless chain revolving over pulleys composed of tread pieces of wood united together by metallic links, which links are connected by rods, and have cogs on one side, which mesh into pinions, to produce the rotary motion required. The present invention consists in forming the links of a combination of the two. It is composed of a cast iron body and wrought iron back, the latter terminating at each end in a curve, forming a bearing for a journal within it.

Improved Extension Table.

James Poolman, Providence, R. I.—This invention consists of a couple of pairs of toggle bars and a right and left threaded screw for working them, combined with an extension table, for extending and contracting it by the turning of the screw. The object is to lessen the labor, so as to accomplish it by one person, and to draw the table tightly and rigidly together, and stiffen up the middle portion, so as to dispense with the middle leg.

Improved Stopping Mechanism for Spinning Jacks.

Frederick H. Crocker, Gonic, N. H.—This is a device which throws off the driving belt in case the squaring band breaks or becomes too loose, and thus prevents the carriage being thrown off the track.

Improved Clothes Pin.

Edmund F. Krelwitz, Humboldt, Mich., assignor to himself and Joseph Mitchell, same place.—This invention consists of a clothes pin made of one piece of sheet metal, bent and corrugated to form spring jaws for retaining the clothes on the line.

Improved Base-Burning Stove.

Melville C. Hawley and William Lennox, Mattoon, Ill.—The bars of the grate are made hollow to allow air to circulate through them. The grate is provided with four hollow arms, which project out through the wall of the stove, some of which may be curved upward and some downward, to promote the circulation. This construction of the grate heats air and discharges it into the room. A conical chamber, placed in the lower fire chamber just below the grate (from which a pipe leads out through the center of the bottom of the base to admit cold air), projects the products of combustion toward the walls of the stove, so as to heat said walls, and thus withdraw the heat from the products of combustion and radiate said heat into the room.

Improved Rotary Churn Dasher.

James J. Robinson, Gibson City, Ill.—The object of this invention is to improve the construction of the churn dasher for which letters patent were issued to the same inventor December 5, 1865. The invention consists in a churn dasher in which bars provided at their ends with cross bars and disks are attached to the shaft in an inclined position, and are so arranged that the upper cross bar and disks of each lower bar may be upon a level with the lower cross bar and disks of the next upper bar; and in the combination of an adjustable gathering board with the dasher shaft. This construction makes the cost of manufacture less, and lessens the labor of operating the dasher.

Improved Sulky Cultivator.

Burton C. Cox, Cooper Hill, Mo.—To the inner side of the inner beams is secured a half keeper, to which and the said beam is pivoted the end of a bar, which is bent inward and downward, and projects beyond the rear part of the said beam. To the rear part of the bar is bolted a guard, to prevent clods, lumps, and other rubbish from being thrown against the young plants and injuring them. The plates have sets of holes formed through them to receive the bolts, so that they may be readily adjusted higher or lower to let more or less soil pass to the plants. Upon the upper edge of the bars is formed a projection, which rests upon the upper edge of the beam and serves as a stop to prevent the fender from dropping down too low.

Improved Cautery Electrode, Vesicular Electrode, and Reservoir Electrode.

Jerome Kidder, New York city.—These are three new inventions, devised by a well known inventor of electro-medical apparatus. The first has for its object so to improve the galvano-cautery instruments for excising tumors, etc., that they may conveniently be operated and the circuit closed and interrupted by the use of one hand only, leaving the other hand at liberty for holding some instrument or for other purposes. It consists of a cautery electrode, with the usual vulcanized rubber handle and slide ring for drawing the incandescent cutting loop, but having the handle extended far enough back of the lower fixed ring that the band may be applied for firmly holding the instrument, while the spring button for closing and interrupting the circuit is placed in front of the fixed ring, to be operated by the forefinger jointly with the drawing back of the slide and loop by the thumb. The second invention consists of a vesicular electrode, with solid non-conducting head into which the ends of the battery-connecting wires are embedded in such a manner as to be readily brought in contact at the side and end, admitting the application of electricity by a more easily manipulated device than with the vesicular electrodes hitherto in use. The third invention is an improved electrode, for common exterior application, by which the disagreeable feeling or shudder produced by the contact of the cold metallic or sponge surface with the body is obviated. It consists of a common electrode, provided with a reservoir for hot water, and a tightly closed orifice for keeping the contact surface warm for application.

Improved Vegetable Dish.

Mrs. Ella Portington, Factoryville, N. Y.—This invention consists of a vessel provided with radial partitions, forming subdivisions, and a tubular center part, for being placed and rotated on a stand. A number of dishes are thus combined in one.

Improved Bush Hammer.

Charles Littlefield, Vinalhaven (Carver's Harbor P. O.), Me.—Upon the ends of the sides of the head are formed flanges, the inner edges of which are curved upon the arcs of circles, and the ends of which project a little beyond the edges of the said head to form a seat for the cutters. The side plates have curved recesses formed in them to receive and fit upon the flanges. In the side plates, near their ends, are formed holes to receive bolts, by which the cutters are secured to the said plates, and the cutters and side plates are secured to the head, binding the various parts of the hammer firmly together.

Improved Coal Chute.

Robert Dunbar, Mansfield Valley, and John Keegan, McDonald, Pa.—This consists of a chute with laterally swinging end scoop, connected by curved adjustable guard plates to the sides of the chute section, to be set to any angle thereto, for conveying the coal without shoveling to any part of the car or boat.

Improved Portable Fence.

Stark Olmstead, Brooks, Ind.—This consists of panels of sawn stuff, having two cross pieces a little distance apart at one end, so that openings are left between. There is one cross piece near the other end, beyond which the slats extend so as to be fitted in the holes between the two cross pieces of another panel. The parts are locked and bound fast by adjusting the panels so connected as nearly in a straight line as may be, making a zigzag fence, which stands upright without posts or stakes in consequence of that form. Besides the binding of the panels together by the coupling effect of straightening the line, a pin is driven diagonally through the projecting end of one of the slats against the cross pieces.

Improved Hoisting Machine.

Victor Duhamel, Easton, Pa.—This invention is a machine which is put in operation by means of a pendulum and ratchet and pawls. It consists of a hoisting drum, which is turned by a pawl operated by the oscillation of the pendulum, when the latter is held to its work by a spring. The drum remains motionless when the pendulum takes its return stroke.

Improved Coal Shovel.

James D. Tallmadge, of Chicago, Ill.—Four wires, more or less, are bent into shape, and are then forced into a wedge-shaped ferrule. The projecting ends of the wires are then bent by hand or upon a properly shaped block into the shape of an ordinary ash shovel.

Improved Machine for Moistening Oleaginous Seeds.

Alfred B. Lawther, Chicago, Ill.—This invention consists of a common or steam-heated reservoir, arranged with one or more revolving perforated stirrer arms, by which the seed is thoroughly mixed and moistened under the admission of hot or cold water or steam.

Business and Personal.

Charge for Insertion under this head is $1 a Line.

Metallic Pattern Letters and Figures, to put on patterns of castings, all sizes. H. W. Knight, Seneca Falls, N.

Hoadley Portable Engines. R. H. Allen & Co., New York, Sole Agents of this best of all patterns.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

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Sumac: Dealers in this article are invited to apply to S. C. Merill, 371 Eighth street, Louisville, Ky., giving information as to its preparation, etc.

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For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

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For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa. for lithograph, &c.

All Fruit-can Tools, Ferracute W'k's, Bridgton, N. J.

Notes & Queries

E. W. P. will find a recipe for waterproof glue on p. 204, vol. 31.—J. M. B. will find a recipe for cement for wood and glass on p. 298, vol. 30.—J. A. L. will find directions for making sun dials on p. 409, vol. 29.—E. I. will find a recipe for aquarium cement on p. 202, vol. 28.—E. A. H. will find directions for tinning iron on p. 362, vol. 31.—F. H. R. will find an answer to his question as to proportions of an oscillating engine on p. 359, vol. 32.—A. E. M. will find a recipe for filling for black walnut wood on p. 315, vol. 30.—E. S. H. will find details of a simple method of galvanizing iron on p. 346, vol. 31.—M. B. will find a recipe for a cement for leather on p. 119, vol. 28.—W. C. L. will find a recipe for shoe polish on p. 283, vol. 31.—E. R. B can gild devices on china by the method described on p. 41, vol. 27.—J. B. Jr. can stain glass blue and red by following the directions on p. 390, vol. 30.—G. O. Jr. will find an explanation of the silvering on glass mystery on pp. 267, 331, vol. 31.—J. K. will find directions for making a cool chamber on p. 351, vol. 31.—H. H. can polish tortoiseshell by following the directions on p. 122, vol. 27.—P. F. T.'s literary queries are not in our line.—M. G. F. can coat iron castings with copper by the process described on p. 90, vol. 31.—P. & Co. can enamel iron by the methods given on p. 362, vol. 32.—L. K. Y. will find a recipe for cement for leather on p. 119, vol. 28.

(1) A. F. A. asks: Would a meniscus lens 1½ inches in diameter, of 6 inches focus, do for a camera for taking photographs? A. Yes, with a stop in front of lens.

(2) C. S. asks: 1. How many times the focus of the lens must a radiant be placed so that the rays may reach the lens sufficiently parallel to form an accurate image at the principal focus? A. At finite distances the image is found at the shorter conjugate focus. 2. In testing an achromatic, while correcting for spherical aberration, is there any means of knowing on what surface the local correction should be made? A. The outer surface. The modern practice is to slightly under correct for color, the spherical aberration being entirely removed. 3. If you will favor us with some practical points in the testing and centering of achromatics, going into details, you will do a great deal for us who are interested in optical experiments, by saving us numerous failures merely from our want of knowledge. A. To test an achromatic, remove the eyepiece and look at the objective lighted by the full moon. Every streak, bubble, or scratch will appear. To center the object glass, put on the cap, place a candle flame at the focus, and tip the glass by bits of tinfoil until the reflected images seen through the blue cone are coincident. Repeat, revolving the tube 90° at a time. In testing for spherical aberration, the images must be sharp, and blurred quickly by a slight movement of eyepiece. Drops of mercury in the sun make a good test object. The test for achromatism: The edge of moon must be claret purple inside the focus and yellowish green outside, colorless when most distinct. Remember that the Huyghenian eyepiece shows color at the edges.

(3) S. asks: 1. How long after interment in the usual mode can human remains be identified? A. The time depends on the nature of the soil. 2. Are the skulls and bones of savage races more enduring in the earth than those of civilized races? A. No.

(4) J. S. C. asks: What will remove the stain of linseed oil from white cotton material? A. Try a little benzine or benzole.

(5) I. McI. asks: When phosphide of calcium is put into water, does the base reduce to powder (simultaneously with the evolution of sulphuretted hydrogen) or does it remain solid? A. The hypophosphite formed is readily soluble in water and goes into solution immediately on formation.

(6) F. W. D. says: I am experimenting in photography, and meet with pretty good success in taking negatives; but when I come to fix the prints, the operation baffles me. I have made a silver bath for the prints in two or three different ways, and the result is the same in every case, namely, the print will always turn to a tan color, instead of remaining black or dark purple. My fixing solution is hyposulphite of soda and water, dissolved in proportions varying from 8 ozs. in 1 quart water to 8 ozs. in 3 quarts water. I leave the prints in the fixing solution about 15 minutes; but they turn within a minute or two. I do not think the fault is in the printing, for I have exposed them till they were so dark as to be almost imperceptible. Where is the difficulty? A. This brick red color will always be found in ordinary silver prints. To obtain this required depth of color it is necessary to subject the print to a toning process, with chloride of gold, or with sulphur, as described in answer to W. P. K., p. 409, vol. 32.

(7) W. P. S. asks: In parts of the west, lightning rods are not insulated but built in the substance of the building. Would it not be equally safe and much cheaper to insert platinum points from the most elevated parts of the building? A. The rods should not be insulated. Platinum points neither add to nor diminish the safety. No rod is safe unless it is continuous, and is connected at its lower end with a large amount of metal or conducting material to the ground.

(8) W. P. H. asks: Do you know of any means by which writing on old parchment can be brought out so as to be legible? A. Cover the letters with powdered ferrocyanide of potassium, with the addition of a little dilute muriatic or nitric acid. This treatment will cause the letters to immediately change to a beautiful deep blue color of great intensity. The superfluous fluid may then be immediately absorbed by the application of the edge of a piece of blotting paper, carefully handled so as not to erase the letters, which are at first very soft, and also to avoid staining the manuscript.

(9) W. W. R. asks: Can I make a cheap microscope, powerful enough to show the sap cells in hard and soft woods, such as maple, pine, spruce, etc.? What lenses do I want, and how shall I place them? A. Showing the sap cells of wood depends more on the preparation of the wood than on the power of the lens. You must cut very fine shavings (best done with a razor) in three ways, across the fiber, parallel to the fiber and with the year rings, and parallel to the fiber and across the year rings. Each shows the cells in a particular way; and by combining the observations, you can obtain the best idea of the cell structure. It takes only a weak power to see these cells. But do not attempt to make a microscope; rather buy one. A small microscope, that is, one with a single lens, will answer, and this costs so little that it would be time lost to attempt to make lenses. If you can buy a very small lens of short focus, that is, with sharp curves, you may easily mount it in a stand; and a simple trial will soon show you where to place the lens and the object.

(10) I. K. says: In a dispute upon the subject of electricity, my friend said that it was a force, and I said it was a substance. Which is right? A. This is a question about which the best electricians disagree.

(11) W. P. asks: In making sulphur molds, what is used to harden the sulphur and take away the brittleness? A. We do not know of anything that satisfactorily fulfils both these requirements.

(12) C. G. V. P. says: Pounded glass dusted on fresh paint makes a beautiful effect for ornamental work. Is such glass an article of trade? A. The substance known as pounded glass is manufactured in the glass house by dipping the end of the ordinary long metallic tube into the pot of pasty or semi-fluid glass in the furnace, when on removing the rod a ball of the pasty material remains attached to its extremity. This is blown by the workman into a huge bubble, and until the sides approach the thinness of the soap bubble film, when an additional puff of air into its interior from his lungs causes it to burst and fall in minute spangles and dust into a proper receptacle prepared for them.

(13) E. E. D. asks: How can I make a camera lucida? A. The simplest form of this instrument consists of a thick and finely polished piece of plate glass placed perpendicular to the drawing board and also to the body of the draftsman. The picture or design which it is wished to reproduce is placed with its back upon the board at one side of the glass plate, while the paper for the reproduction is placed in like manner upon the opposite side. On looking at the glass plate from above, and slightly on that side upon which the design lies, an image of the same is distinctly seen, apparently on the drawing paper on the opposite side of the plate.

(14) B. D. asks: Can a lithographer perfect the corners, turns, shading, etc., of imperfect writing? A. Yes.

1. In a new schoolroom the blackboards, painted on brick walls, sweat so much that they become useless for several days. The room is on the lower floor, out not in a basement. Can you give me the cause, with a remedy to prevent it? A. It is very likely due to the fact that the walls have not yet become thoroughly seasoned. Keep the interior of the room at as warm a temperature as possible until the annoyance is dissipated. 2. I have a prescription for painting blackboards in which spirits and spirit varnish are both mentioned. Please tell me the difference between them. Is not spirits another name for alcohol? A. Spirit varnish is probably a solution of shellac in alcohol. Alcohol is commonly called spirits.

Is there any method, process, or ingredient that will keep ink from freezing? A. Ink may be preserved from freezing by enveloping the vessel containing it in some non-conducting substance, such as straw, sawdust, or woolen fabrics.

(15) T. S. G. asks: How high can a pump draw water up a tube? Can it draw over 33 feet? A. No: 33 feet is the highest. The pump should never be more than 28 feet from the water, and even then it requires a firstrate pump to suck water.

(16) F. A. B. asks: What are the ingredients for glazing earthen or crockery ware? A. For ordinary earthenware use the following: White sand 40 lbs., pearlash 21 lbs., and common salt 15 lbs. Calcine them for some time over a moderate fire, and when the mixture is cold grind to a very fine powder. When wanted, temper it with water, and it will be ready for use.

(17) W. E. T. asks: Is there any preparation for silver plating iron? A. Yes. See pp. 84 and 405, vol. 32.

How can I take ink stains out of leather? A. Try a little oxalic acid in water.

(18) F. S. asks: How can I cut glass tubing? A. We separate small glass tubing very easily and without difficulty by first scoring it all the way around, at the point where the separation is desired, by means of a small three-cornered file. The tube is then grasped firmly with both hands on either side of the file mark, with the thumbs approaching it on opposite sides to within about an eighth of an inch; a quick and firm pressure with both thumbs, simultaneously, while the rest of the hand remains in position, will do the work satisfactorily. To remove the sharp edges of the severed tube, it is only necessary to hold its ends alternately in the flame of a spirit lamp or Bunsen burner for a few minutes.

(19) A. L. B. asks: 1. What is citrate of magnesia? A. It is a combination of citric acid (acid of lemons) with magnesia. 2. How is it made? A. It may be formed by decomposing the carbonate of magnesia by a hot aqueous solution of citric acid. 3. What are its properties? A. It is used medicinally as a mild laxative.

(20) E. L. G. asks: Is there a cheap way of producing an electric light to be used for 12 hours? A. A suitable light for your purpose would require an electromotive force equal to about 50 Grove or Bunsen cells. The cost of such a light (derived from the consumption of zinc, etc., in the battery), for the period of time that you mention, would be considerable. The electric light may now, however, be obtained at a very moderate cost, by means of a Gramme's machine, driven by a small steam engine or other available power. In this case the electric energy is not obtained by chemical action, but by the direct conversion of mechanical motion into electricity.

(21) B. F. T. asks: Is the heaviest coal the best? A. Not always. The impurities contained in coal very materially affect the specific gravity.

(22) C. D. asks: How can I transfer printed letters to silver or silver plate for engravings? A. Try the process of daguerreotypy.

(23) M. S. W. says: I desire to utilize the escape steam of an engine 12x48 inches, working at 75 lbs. pressure, by passing it through copper pipes placed in a wooden tank 25 feet long by 36 inches wide. I use a 4½ inch exhaust pipe of copper, which I propose to connect with two 4½ inch copper pipes that will run round in the tank. 1. Shall I, in this arrangement, utilize much heat? A. You can utilize a considerable portion of the heat in the exhaust steam by this method. 2. Will this make much back pressure on my engine? A. Not materially. 3. Would you advise a steam trap? A. A trap will render the apparatus more efficient.

(24) J. C. H. says: I have a 1 horse power engine and vertical boiler. The boiler is 18 inches in diameter, 32 inches high, with firebox 15 inches diameter, 16 inches high, and 24 half inch tubes 16 inches long. In using wood or coke for fuel it works very well, but I desire to use soft coal because it saves firing so often. One day's use of soft coal stops the tubes up with soot, so that they require to be cleaned every day. How can I remedy it? A. Try the plan of dampening the coal a little before firing.

(25) J. M. asks: What size of boiler will suit a 15 feet long boat with a 15 inch diameter screw propeller, and of what size should the cylinder be? A. Cylinder 2¾x4 inches. Boiler with 40 to 50 square feet of efficient heating surface.

(26) E. R. says: A mill takes its supply of water from a well that is dug to the depth of 45 feet, and bored 50 feet further; the well does not supply sufficient water, and I propose to remedy it by closing the top of the well airtight, and conducting the exhaust steam of the engine into the well at the top, then suspending a pipe of same size as pipe from engine from the top to within 3 or 4 feet from the bottom of the well, and connecting the top of this pipe with the open air by means of another pipe. The well being 5 feet in diameter, the steam would be brought in contact with over 700 square feet of rock condensing surface, which would, I believe, condense the greater part of the steam, or enough to supply the deficiency. How will this arrangement do? A. Your idea strikes us very favorably.

(27) H. E. S. asks: Is the pressure of water greater on the bottom of a tube that is twice the diameter at the top that it is at the bottom, than in a tube that is the same diameter through the whole length? A. If the hight of water in each tube is the same, the pressure on the bottom of each, per unit of surface, is also the same.

(28) J. M. S.—The Chicago newspaper referred to had no authority for saying that the Patent Office had sets of from 20 to 25 volumes of annual reports, which parties could have mailed to them by addressing the Commissioner, enclosing a small fee to cover postage. The reports remaining in the Patent Office are not of a connected series, being mostly for years between 1859 and 1862. These are of no real service in looking up inventions, and, without subsequent volumes, are a delusion and a snare to any who are searching for reliable information as to patents issued. The best way is to employ some one accustomed to making searches in the Patent Office to examine and report if an invention is probably patentable. By sending a model, drawing, or photograph, accompanied with description and a fee of $5 to the office of this paper, such examination will be made and a written report sent by mail to any part of the world.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

R. B.—It is iron pyrites.—W. R. W.—Your specimen of tree lice is, so far as we know, undescribed. We have sent it to the Department of Agriculture, Washington, D. C.—W. H. M.—They are fossils, consisting of silex, clay, and oxide of iron, but not sufficient to make an ore.—J. C. W.—The clay is worthless for making porcelain.—J. McW.—They are specimens of quartz and serpentine, of no value.—J. G. McM.—It is hematite.—W. M. S.—We did not detect nickel.

Correspondents who send specimens of minerals, well waters, entomological and botanical subjects, etc., for examination, should carefully and legibly mark the package or box containing the

same with the sender's name. Much confusion and trouble is often caused by such unmarked packages becoming separated from the letters sent with them.

W. B. H. asks: When is the best time for moving grape vines?—S. asks; How can I make a red, blue, and white stencil ink, such as is used for marking boxes, etc.?—C. L. S. and others ask: How can I make transfer paper for marking linen indelibly? It is used in this way: Place the transfer paper upon the linen to be marked, and over that place a piece of ordinary white writing paper, and mark with a lead or slate pencil or stiletto Heat the writing with a moderately hot flat iron for two or three minutes, and it is permanent.—W. F. W. asks: What prevents bees from swarming, and what will induce them to swarm?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Keely Motor. By J. C., by E. T., by J. J. A., by O., by C. F., by W. L. D., by B. K., and by J. C. H.

On Evergreens in Orchards. By F. R. E.

On Tides in the Gulf of Mexico. By T. H.

On Powder Mill Explosions. By J. M.

On the Spider's Web. By S. T. W.

On Melting Iron. By T. H. A.

On Spring Power for Cars. By F. G. W.

On a Singular Electrical Phenomenon. By T. P. C.

Also inquiries and answers from the following:

G. H. B.—F. H.—J. D. C.—C. C.—J. D. S.—C. B. B.—H. G. W.—D. A. W.—R. C. T.—R. C. C.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who buys rare coins? Who makes wooden screw bungs? Who builds bridges? Where can molds for ornamental vases be obtained? Who sells pure platinum? Who sells engraver's tools?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week ending

June 29, 1875,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Addressing machine, E. Longley	164,925
Air compressor valve, etc., Reynolds & Miller	165.120
Anchor, W. A. Currier	164,975
Anchor, A. Smith	165,036
Bale tie, W. P. Elliott	165,081
Band fastener, E. Dresser	165,079
Basket, stave, S. H. Wheeler	165,045
Basket, wicker, U. S. Wolf	165,047
Beams, etc., making hollow, I. Hahn	165,094
Bed bottom, spring, J. C. Anderson	164,957
Bedstead, invalid, Deneef and Wilkin	165,075
Beer, etc., compound for preserving, W. Zinsser	165,145
Beer with gas, charging, J. C. Kennedy	166,004
Belt coupling, G. A. Manning	165,010
Bessemer converter, A. S. Dunning	164,982
Bit, expansible, F. Willig	164,953
Bit, wood-boring, G. L. Holt	164,999
Blacking bottles, etc., stopper for, H. D. Forbes	164,912
Blast apparatus, hot, H. Essex	165,084
Boiler for stoves, etc., upright, Lawton & Gibson	165.105
Boiler, steam, E. D. Leavitt, Jr	165,006
Boilers, covering for steam, W. Peters (r)	6,516
Boiler feed water heater, J. Armstrong	164,959
Boot, T. Powell, (r)	6,522
Boot rands, cutting, C. H. Brigham	164,963
Boot toe protector, R. & J. Evitt	164,085
Boots, crimping leather for, S. W. Jamison, (r)	6,525
Bottle carrier, soda, A. F. Knorp	165,005
Bottle dropping, C. C. Garrett	165,091
Bottle measuring, F. S. Baldwin	165,054
Bottles, extracting corks from, Page & Fahy	164,931
Brewer's washing machine, F. Cramme	164,906
Bung and bush, W. Johnson	165,001
Burner, electric gas lighting, S. Gardiner, Jr	165,090
Burner for heating, gas, W. R. Hanks	165,095
Burner, lamp, T. D. Parsons	164,932
Burning hay, straw, leaves, etc., A. Hamilton	164,993
Bustle, C. O. Crosby	165,069
Butter box veneers, preparing, S. F. Spaulding	165,945
Camera stand, F. M. Spencer	165,038
Can, airtight, S. Joyce	166,003
Canes, etc., bone handle for, J. Harvey, (r)	6,513
Cap, reversible, M. Fox	164,987
Car brake, Aldrich & Huggins	164,955
Car brake, S. F. Littlefield	165,008
Car coupling, W. H. Bodenhamer	164,961
Car coupling, C. E. Ramage	165,025
Car replacer, W. Elms	165,082
Car starter, Bailey & Pool	165,052
Car starter, G. S. Curtis	165,070
Carbureter, J. R. Allen	165,050
Carpet stretcher, E. P. Shaffer	165,032
Carpet stretcher and holder, D. Peters	165,022
Carriage seat, C. K. Mellinger	165,016
Cartridge cases necking, B. Payne, (r) 6,520,	6,521
Catch for cupboards, etc., C. G. Schneider	164,941
Casting plow points, G. Wiard	165,046
Casting propeller wheels, flask for, Swift & List	165,039
Centrifugal machine, G. Dinkel	165,077
Chimney cowl, A. J. Robinson	165,028
Chuck, planer, Prouty, Coes, & Taft	164,934
Churn, rotary, Felt & Child	165,086
Churn, rotary, J. J. Shelton	165,033
Cigar mold, N. Du Brul	164,981
Cigar tip cutter, etc., E. F. W. Eisenmann	164,984
Clutch, friction, I. Arnold	164,898
Cock, stop, A. Snyder	164,944
Cooler, milk, W. H. Johnson	165,102
Corn stalk cutter, A. C. Smith	165,128
Cotton compress, J. J. Cahoon	164,903
Cotton openers, beater for, J. E. Crane	165,066
Cotton pickers, beater for, G. E. Taft	164,948
Crimping machine, S. W. Jamison, (r)	6,526
Culinary grater, E. Woodward	165,143
Cultivator, T. F. & W. Vandergrift	165,136
Cultivator, corn, A. F. Batcheller	164,960
Dial, gage, Crosby & Meady	164,908
Dredger, pneumatic, W. Smith	165,035
Drill, steam rock, J. C. Githens	164,990
Drills, chuck for rock, J. C. Githens	164,991
Drip trough for ice boxes, Dyer & Powell	164,933
Dryer and baker, W. P. Corsa	164,974
Drying apparatus, L. K. Fuller	165,088
Egg box covers, etc., fastening, W. Weis	165,044
Engine, air hand, C. W. Riley	165,027
Engine, electro-magnetic, T. Chutaux	165,064
Engine, fire, J. Bean	165,056
Engine governor, steam, J. C. Hoadley	164,917
Engine governor, steam, C. G. Sims	164,942
Engine, steam, D. K. West	165,139
Eyelet, T. Garrick, (r)	6,512
Fats, separating, C. M. Cresson	164,907
Feed cutter, E. Wagoner	165,138
Feed cutter, T. Webb	165.043
Fence wire, D. C. Stover	164,947
Fence wires stretching, J. F. Duffy	164,910
Filling hook for weaving hair cloth, J. Turpie	164,949
Fire arm, breech-loading, O. Schneeloch	165,031
Fire brick, manufacture of, J. P. Alexander	165,049
Fire irons, stand for, E. A. Jackson	165,101
Fire place, W. Tweeddale	165,134
Flower pot, J. S. Johnson	165,000
Food preserver, C. Brown	164,964
Foot rest, Edgcomb & Gore	164,911
Fork and skewer pull, combined, E. W. Anderson	164,956
Fork and skimmer combined, A. B. Nott	165,117
Fruit dryer, A. J. Reynolds	165,121
Fruit picker, J. Bailey	165,053
Furnace and range, hot air, L. G. Hallberg	164,916
Furnace and stove, E. Hawkes	164,995
Furniture castor, J. T. Codman	164,973
Fuse, electric, C. L. Kalmbach	164,921
Gage dial, Crosby & Meady	164,908
Gas from petroleum, J. McClarty	165,012
Gas scrubber and condenser, W. H. White	165,141
Gateway, S. L. Fisher	164,986
Glove stretcher, D. S. Hayward	165.096
Grain drill, E. D. Mead	165,015
Grain tally, A. K. Munson	165,021
Harness hame, A. H. Cresap, Jr	164,067
Harrow, J. Mastern	165.108
Harvester, L. B. Stilson (r)	6,524
Harvester cutter, T. R. Arnold	164,958
Harvester pitman, guide, etc., E. F. Herrington (r)	6,514
Harvester rake, J. S. Marsh	164,926
Hat and cap, Isidor & Hein	165,100
Head block, J. F. Cook	165,065
Heating buildings, etc., A. P. Pitkin	165,983
Heating apparatus, steam, I. C. Richardson	164,935
Hen's nest, J. P. Clement	164,971
Hinges, covering plate for, H. T. Blake	165,061
Hook, snap, G. Reynolds	165.122
Hopple, J Shive	165,127
Horse toe weight, etc., H. D. McKinney	165,014
Horseshoe blank bar, H. H. Gilmore	164,914
Hose, hydraulic, J. M. Stone	164,946
Hub, A. Rimes	164,936
Ice boxes, drip trough for, Dyer & Powell	164,983
Ironing board, G. E. Hollister	164,998
Jar lifter, W. W. Brower	164,968
Key hole guard, J. Goldstein	164,992
Knife, tobacco, Lane & Cullom	165,104
Ladle, Curtis & Rowley	165,071
Lamp chimney, G. Niedermair	165,116
Lamp fount, E. Brown	164,965
Lamp, gas fitter's, J. D. Galloway	165,089
Lantern, reservoir street, A. H. Watkins	165,042
Lathing, securing metallic, J. W. Hoyt	164,919
Leather, treatment of, H. Smith	165,129
Lock for doors, W. Unverzagt	165,041
Locks, catch plate for bag, W. Roemer	164,939
Locomotive, hydrocarbon burning, J. M. Goodwin	164,915
Locomotive exhaust, W. Stamp	165,130
Loom, J. M. Linscott	163,924
Match safe, H. C. Wilcox	165,142
Measuring packaged fabrics, S. C. Talcott	165,131
Moldings, polishing, J. A. Dayton	165,073
Motion, transmitting and regulating, J. Zengel	165,144
Oil tank extinguisher, R. Dittrich	165,078
Oiler, Bohm, Stuhr, and Joecken	164,962
Ore, treating, D. Mindeleff (r)	6,519
Organ, reed, Bach and Berg	164,900
Organ keyboards, etc., making, M. Pratt	165,024
Paddle wheel, J. Salter	165,029
Painters' use, breamer for, I. Hayes	164,996
Paper barrel, J. W. Jarboe (r)	6,515
Paper box, J. R. Van Vechten	165,137
Paper cutter, rotary, A. Judson	164,920
Paper folding machine, etc., C. Chambers, Jr	164,904
Paper folding machine, W. Daniels	164,977
Paper folding machine, W. and C. Daniels	164,978
Pavement, composition, J. P. Cranford (r)	6,511
Pencil case, W. I. Ludlow	165,009
Pencil rubber eraser, J. B. Blair (r)	6,510
Photographic head rest, F. M. Spencer	165,087
Photographic vignetting machine, C. C. Merrill	165,017
Photographs, burnisher for, E. R. Weston	165,140
Piano stringing device, A. G. Gardner	164,988
Picture frame, J. T. Robertson	164,937
Pipe, smoking, C. J. Jonassen	165,002
Pitman, J. R. Taylor	165,040
Planes, guide for bench, H. P. Taylor	165,132
Planing machine, wood, J. S. Graham	164,989
Planter check row attachment, M. Newton	165,115
Plows, L. B. White 164,951,	164,952
Plow points, casting, G. Wiard	165,046
Plow, sulky, G. Moore	164,929
Pocket books, clasp for, L. Messer	165,110
Polishing machine feed, J. A. Dayton	165,074
Posts, metal cap for, J. Davenport	164,979
Press, brick and soap, J. H. Hearn	164,997
Press, cotton, S. Dike	164,980
Press, hay and cotton, J. L. De Witt	164,076
Press, hay and straw, L. Kirk	164,922
Pump governor, C. W. Mills	165,112
Punch E. J. Brooks	165,062
Radiator, steam, E. F. Osborne	165,118
Radiator, valve for steam, J. W. Faxon	164,985
Railway, pneumatic, R. R. Gregg	165,092
Reflector, heat, L. B. Woolfolk	165,048
Rein holder, M. Cain	164,970
Revolvers, safety catch for, C. W. Hopkins	165,098
Riveting machine, R. H. Tweddell	165,135
Roofing, metallic, S. T. G. Morsell	165,113
Row lock, M. F. Davis	165,072
Saw frame, buck, C. A. Hurlburt	165,099
Saws, handle for crosscut, E. Andrews	165,051
Scale and balance stand, R. Murdoch	165,114
Scale beam, W. T. Robinson	164,938
Shears, manufacture of, O. Norton	164,930
Shoe and glove buttoner, G. Stackpole (r)	6,523
Show case, W. B. Smith	165,034
Sieve, Epeneter and Grahl	165,083
Skirt supporter, C. P. Clark	164,905
Slate, C. C. Shepherd	165,126
Sleigh runner frames, bending, J. W. Karn *et al.*	165,103
Sole edge machine, C. D. Bigelow	165,060
Spark arrester, C. L. Eastman	165,080
Spring setting machine, A. J. Fisk	165,087
Steamboat staging, A. J. Bell (r)	6,509
Steel, casting, Critchlow and Kidd	165,068
Stove grate, J. Moore, Jr	165,020
Stove, heating, J. K. Babcock	164,899
Strap handle, package, S. L. Harrell	164,994
Table, extension, J. F. Martin	165,107
Table, folding, E. J. Marsters	165,011
Table, ironing, J. L. Brown	164,966
Table, parlor, F. H. Cutler	164,976
Tag machine, H. D. Mentzel	165,109
Tailor's measure, F. B. Smith	164,943
Tailor's measuring apparatus, A. H. Richey	165,026
Teeth, artificial, W. H. Gates	164,913
Telegraph, dial electric, C. T. Chester	165,063
Telegraph, train, A. Ryder	164,940
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Tobacco knife, Lane and Cullom	165,104
Tobacco machine, plug, J. L. Jones (r)	6,517
Tongue support, G. W. Burnside	164,969
Tool holding device, A. G. Rykert	164,124
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Umbrella, G. G. Griswold	165,093
Umbrella handle, H. G. Mackinney	165,106
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Velocipede, W. Bush	164,902
Ventilating halls, etc., P. Mihan	164,928
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Vehicle hub, J. C Hendry	165,097
Vessels, air port for, J. S. Wilson	164,954
Wash stand, M. P. Brown	164,967
Washing machine, L. Becker	165,058
Washing machine for brewer's use, F. Cramme	161,906
Watch case spring and catch, I. N. Hopkins	164,918
Water channel obstruction, preventing, L. Beebe	165,059
Water sprinkling nozzle, C. H. Miller	165,111
Water wheel, E. B. Cope	164,909
Water wheel, turbine, W. Mercer	164,927
Weather boarding, H. L. Clippenger	164,972
Weaving hair cloth, filling hook for, J. Turpie	164,949
Windmill, G. Lauby	164,923
Windmill, J. McGovern	162,013
Windmill, J. Sanders	165,030
Wire stretcher, H. Miles	165,019
Wood-bending machine, W. Briggs	164,901
Wood, bit for boring, G. L. Holt	164,999
Wringer, L. Becker	165,057
Yarn, case for exhibiting, H. J. Millmann	165,018

DESIGNS PATENTED.

8,428 to 8,439.—CARPETS.—R. Allan, Yonkers, N. Y.

8,440.—PIANO STOOLS.—G. W. Archer, Rochester, N. Y.

8,441.—STOVES.—W. Burrows, New York city.

8,442.—POTTERY.—T. H. Copeland, Geddes, N. Y.

8,443.—CARD OF BUTTONS.—G. Farmer, Brooklyn, N. Y.

8,444, 8,445.—CARPETS.—H. F. Goetze, Boston, Mass.

8,446, 8,447.—TYPE.—C. E. Heyer, Boston, Mass.

8,448.—COFFIN PLATES.—W. Parkin, Taunton, Mass.

8,449.—ADVERTISING LANTERN.—F. L. Pisch, N. Y. city.

SCHEDULE OF PATENT FEES.

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On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
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On application for Design (7 years)	$15
On application for Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

June 18 to July 7, 1875.

4,886.—P. Wright, Ottawa City, Ont. Backband for cart saddles. June 18, 1875.

4,887.—G. H. Reynolds, New York city, U. S. Rock-drilling machine. June 18, 1875.

4,888.—L. Munro, Ottawa, Ont., *et al.* Spooler and pincushion combined. June 24, 1875.

4,889.—J. E. Buerk, Boston, Mass., U. S. Watchman's time detecter. June 24, 1875.

4,890.—W. P. Widdifield, Siloam, Ont. Saw carriage and feed movement. June 24, 1875.

4,891.—E. Seaman, Andover, N. Y., U. S. Window blind. June 24, 1875.

4,892.—J. S. Wallace *et al*, Belfast, Ireland. Fire extinguisher. June 24, 1875.

4,893.—L. B. Stilson, Minneapolis, Minn., U. S. Safety car truck. June 24, 1875.

4,894.—E. F. Chapin *et al.*, Boston, Mass., U. S. Lamp extinguisher. June 24, 1875.

4,895.—O. Pagan *et al.*, Philadelphia, Pa., U. S. Roller tube expander. June 24, 1875.

4,896.—J. M. Munro *et al.*, Ottawa, Ont. Horse hoe. June 26, 1875.

4,897.—F. Rourk, Montreal, P. Q. Ventilation of sewers. June 28, 1875.

4,898.—N. Campbell, Rochester, N. Y., U. S. Curtain fixture. June 28, 1875.

4,899.—W. T. Wood, Mount Juliet, Tenn., U. S. Lamp extinguisher. June 28, 1875.

4,900.—A. A. Post, New York city, U. S. Liquid meter. June 28, 1875.

4,901.—F. J. Davis, Newport, Vt., U. S. Foot power lasting tool. June 28, 1875.

4,902.—H. Hagie, Warwick, Ont. Gate. June 28, 1875.

4,903.—J. S. Brooks, Pittsburgh, Pa., U. S. Backing electrotypes. June 28, 1875.

4,904.—J. C. Rorick, Wauseon, Ohio, U. S. Butter worker. June 28, 1875.

4,905.—C. J. Eames, New York city, U. S. Hydrocarbon reducing furnace. June 28, 1875.

4,906.—C. Lundy, East Gwillimbury, Ont. Hay rake. June 28, 1875.

4,907.—J. Hewitt, Grimsby, Ont. Fluting and glossing iron. June 28, 1875.

4,908.—A. Beaudry, Boston, Mass., U. S. Adze and ax. June 28, 1875.

4,909.—J. Flower, Detroit, Mich., U. S. Street hydrant. June 28, 1875.

4,910.—A. R. Morgan, New York city, U. S. Stove June 28, 1875.

4,911.—Wm. C. Shorey, Napanee, Ont. Horse hay knives and forks. July 6, 1875.

4,912.—S. Spencer, Boston, Mass., U. S. Burial casket. July 6, 1875.

4,913.—A. Gardner, Windsor, P. Q. Bevel pump engine. July 6, 1875

4,914.—G. W. Walker, Malden, Mass., U. S. Portable ranges. July 6, 1875.

4,915.—S. O. Greening, Hamilton, Ont. Lightning rod. July 6, 1875.

4,916.—J. F. Glidden, De Kalb, Ill., U. S. Wire fence. July 6, 1875.

4,917.—C. A. Sipe, Fairmount, W. Va., U. S. Apparatus for depositing coffins. July 6, 1875.

4,918.—M. Waterbury, Mason City, Iowa, U. S. Lamp extinguisher. July 6, 1875.

4,919.—J. Bellamy, Newtonville, Ont. Bag holder and truck. July 6, 1875.

4,920.—A. D. Williams, Yorkville, Ont. Dinner pail. July 6, 1875.

4,921.—R. C. Lambart, Quincy, Mass., U. S. Heel and sole trimming machine. July 6, 1875.

4,922.—R. R. Osgood, Troy, N. Y., U. S. Dredging machine. July 6, 1875.

4,923.—E. A. Beers, De Kalb Center, Ill., U. S. Draft equalizer. July 6, 1875.

4,924.—W. D. Peters *et al.*, Boston, Mass., U. S. Drainer for ships. July 6, 1875.

4,925.—A. W. Newell, Bradford, Pa., U. S. Tincture and prescription bottle. July 6, 1875.

4,926.—C. C. Brayley, Toronto, Ont. Rotary engine. July 6, 1875.

4,927.—N. W. Clark, Clarkston, Mich., U. S. Fish-hatching apparatus. July 6, 1875.

4,928.—W. S. Harland, Clinton, Ont. Self-heating glue pot. July 6, 1875.

4,929.—J. Payne, New Hamburg, Ont. Thistle destroyer. July 6, 1875.

4,930.—A. H. Laflin, New York city, U. S. Disintegrating fiberous substances. July 6, 1875.

4,931.—A. Forbriger, Cincinnati, Ohio, U. S. Drawing or copy book. July 6, 1875.

4,932.—D. A. Root, South Bay City, Mich., U. S. Pad lock. July 6, 1875.

4,933.—W. E. Skinner, Milford, Mich., U. S. Quadrant bevel gage. July 6, 1875.

4,934.—W. M. Caterson, Philadelphia, Pa., U. S. Poison bottle. July 6, 1875.

4,935.—C. Windrath, Buffalo, N. Y., U. S. Cigar-bunching machine. July 6, 1875.

4,936.—R. Patrick *et al.*, Branchton, Ont. Double-acting reversible rotary pump. July 7, 1875.

4,937.—G. C. Hill, Danbury, Conn., U. S. Ironing board. July 7, 1875.

4,938.—W. M. Fuller *et al.*, New York city, U. S. Car heater. July 7, 1875.

4,939.—A. H. Laflin, New York city, U. S. Disintegrating fiberous substances. July 7, 1875.

4,940.—J. B. McDonald, Tiverton, Ont. Animal poke. July 7, 1875.

4,941.—D. W. Douglas, Almonte, Ont. Water filter. July 7, 1875.

4,942.—J. H. Crowell, Providence, R. I., U. S. Machine for making weavers' harness. July 7, 1875.

4,943.—J. M. Gover, Brockville, Ont. Extension drying table, etc. July 7, 1875.

4,944.—J. Martin, Jr., Toronto, Ont. Brick-making machine. July 7, 1875.

4,945.—Russel Pickel *et al.*, Plattsburg, N. Y., U. S. Railway switch. July 7, 1875.

4,946.—D. Pease, Floyd, N. Y., U. S. Buckwheat cleaning machine. July 7, 1875.

4,947.—P. C. Marsh, Northampton, Mass., U. S. Reefing sails. July 7, 1875.

4,948 & 4,949.—E. Gray, Chicago, Ill., U. S. Electro harmonic telegraphs. July 7, 1875.

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And How to Obtain Them.
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PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

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